SCIENTIFIC AMERICAN

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THE CITY OF ABERDEEN, A GREAT LUMBER CENTER, WASHINGTON TERRITORY.

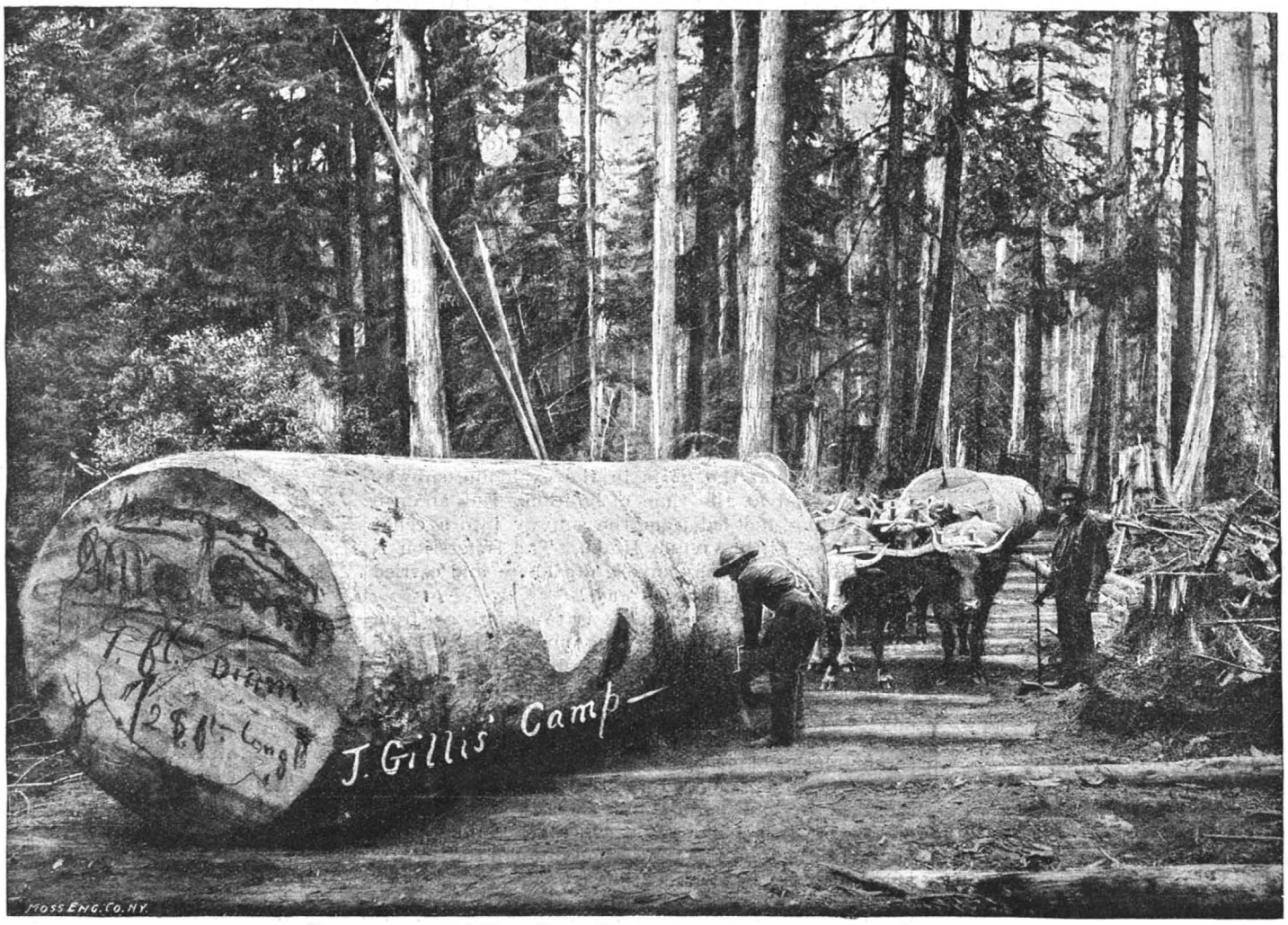
The accompanying illustration is from a photo. and is a correct view (see page 118) of the town as it appears today. The town was founded in 1884. It now has a population of 1,600, a gain of more than double in twelve months.

The view is looking westerly toward the Pacific ocean, seen in the distance. At the base is the narrow but navigable Wiskah, which, with the broader and more capacious Chehalis river, empties into Gray's harbor, the three forming their junction at the town, affording abundant deep water dock front, several miles in extent.

Mr. Samuel Benn, the present pioneer resident and the original proprietor of the entire neighborhood, came here thirty-three years ago and bought 700 acres of government land, costing him $1.25 per acre, which he would several times have been glad to have sold out for $1.50 per acre if he had had an opportunity. To-day the less desirable sections of it are held at $50 per acre, and many village lots that he sold recently at $10 each have changed hands at $1,000 each.

There is 22 ft. of water on the harbor bar at *low* water. A sailing vessel can leave here, and in three hours, and without the aid or expense of a tug, be sailing on the broad Pacific.

The town has already three churches, two schools, one bank, nine saw mills, daily capacity 450,000 feet, four salmon factories, one furniture factory, one foundry, boiler and machine shop, two ship yards, one weekly paper, two steamers connecting with Portland (outside), two hotels, etc. Two railroads connecting with the North Pacific Railway are in process of construction. One of the views represents a scene in a logging camp near Aberdeen.



TRANSPORTATION OF LOGS TO WATER.

LOGGING CAMP NEAR ABERDEEN, WASHINGTON TERRITORY.

In these camps the labor is subdivided, and the wages are high. A foreman will receive per month $150; teamsters or bull punchers, $125; axmen and sawyers, $80; greasers, who swab the skids with grease, $35; hook tenders, $80; cooks, $60; boomers, who float logs to mills, $85.

Bull punchers here are necessarily men of ability. Some receive as high as $150 per month. Men that are able to handle a dozen yoke of cattle, and get all there is out of them when a pinch comes, are scarce.

For obvious reasons, cattle alone are used as motive power in the woods.

It will be noticed that the operators each stand on spring boards set in notches about five feet from the ground. This is done to save labor of cutting through the swell at the butt end, the diameter of which at the ground is frequently double that of the log 20 feet higher up. Thus, in looking over a camp stumps 20 feet high are often seen, and one is curious to know why such an apparent waste of timber is

(*Continued on page* 118.)

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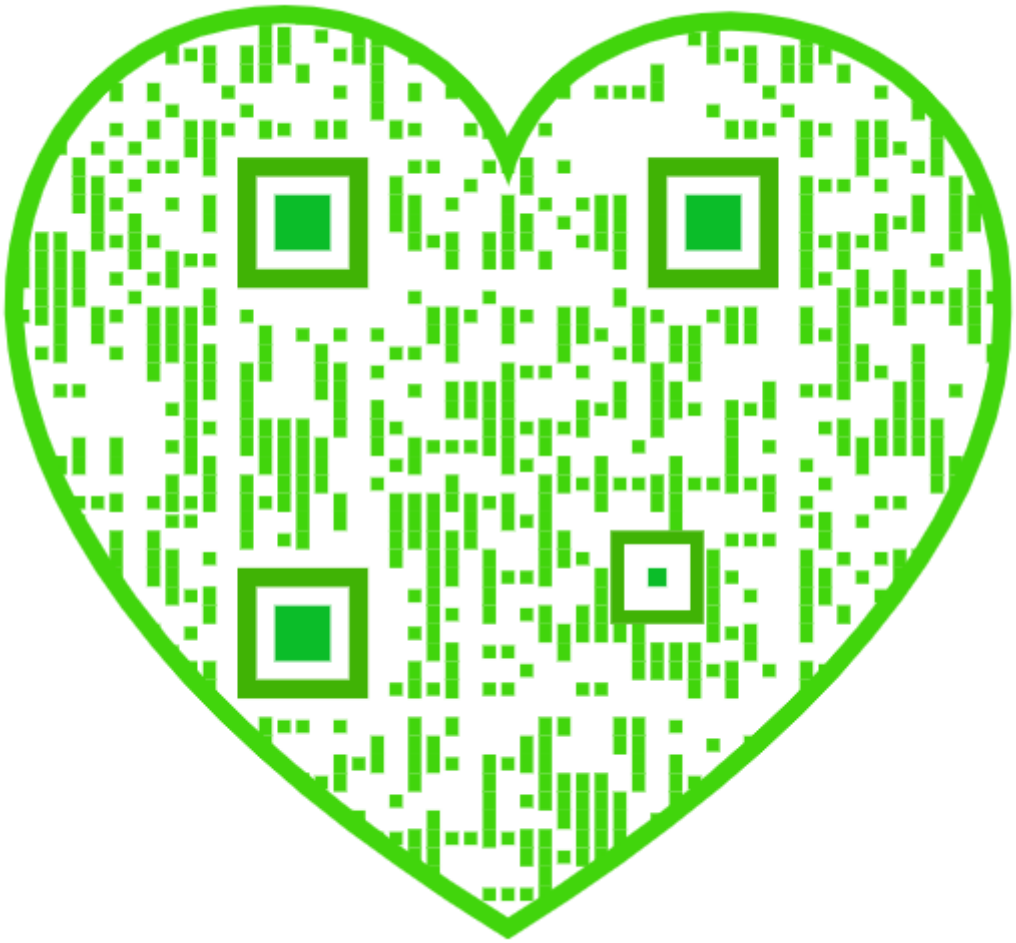

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Toronto meeeting of this scientific body, to be held from August 27 to September 7, promises features of unusual interest. The general sessions will be held in Convocation Hall, University Buildings. Major J. W. Powell, the retiring president, will give his address on the evening of the 28th inst., and the vice-presidents of the various sections will speak before their sections during the afternoon of that day. Special meetings will be held of the Entomological Club, the Botanical Club, the Agricultural Society, and the American Geological Society during the sessions of the A. A. A. S. Papers will be read by Prof. J. D. Dana, Dr. E. O Hovey, Prof. Gilbert, Prof. Newberry, Prof. J. LeConte, Prof. A. Winchell, Mr. C. D. Walcott, and others. The president-elect of the association is Prof. T. C. Mendenhall, of Terre Haute, Indiana, at the head of the Rose Polytechnic School. The usual facilities have been secured as to transportation, mail, telegraph, and express, and by courtesy all articles for use at the meeting will be admitted free. Excursions are planned to Niagara Falls, Montreal, Quebec, and Muskoka, and arrangements are being made for one to the Pacific coast.

REPORT ON EXPLOSIONS IN THE ELECTRIC SUBWAYS.

A special committee of the Board of Electrical Control of the City of New York has presented its report on the above subject. It appears very evident that the electric subways are a perpetual menace to the lives and property of the inhabitants of this city. It was eminently proper that, in view of the recent accidents, a special investigation should be made of the subject. The report deals with the mysterious explosions of the last year, and offers a plausible cause for one of them, known as the Fifth Avenue explosion. It appears that the wires in the exploding subway were all dead at the time of ignition. But an open distributing duct led from the subway into a cellar under the Fifth Avenue Hotel. The suggestion is made that the gas may have ignited here and carried the flame back into the subways.

The remedy for the trouble is to exclude gas from the ducts and manholes. This ground is taken by the report. The engineers of the Subway Construction Company have done their best to effect this by adopting as tightly sealed a system as possible, but without avail. The next most obvious method of excluding an accumulation of gas was ventilation, and of the various means tried, only one proved really efficacious. This consists in blowing air into the subways by force blowers. This maintains a slight excess of pressure in them which insures ventilation through the inevitable cracks and leakages in the structure, and also excludes gas by reason of that excess. This system is analogous to that adopted by the gas companies in distributing their product under pressure all over the city.

The root of the trouble is the presence of gas due to leakage. The streets of this city contain the distributing mains of a number of gas companies. Most of them are of cast iron with tamped or calked lead joints every twelve feet. Many miles were laid with the utmost dispatch by contractors. Some of them have been in use for perhaps fifty years. In this system there is ample chance for leakage. Yet, owing to the great resistance of cast iron to underground corrosion, the mains themselves, if properly calked at the joints, might be regarded as secure. But many are very poorly laid. Not only is there every certainty that there are hundreds of badly calked joints, but the system of service pipes for individual houses is the occasion of much leakage. These are of wrought iron welded tubing, that corrodes much more rapidly than cast iron, and to them a great deal of the leakage is to be traced.

Every one who passes excavations in our streets can notice the characteristic odor of the gas-saturated soil. Gas is everywhere underground. Several hundreds of millions of cubic feet escape annually from the gas pipes into the soil. The report we are considering very consistently places the onus of the subway explosions upon the shoulders of the gas companies, and affirms that they should cure the evil by preventing the escape.

Logical as this sounds, it opens up a dire possibility. Should the gas companies attempt the work of renewing service pipes, replacing them with less perishable ones, and of recalking the joints in their mains, the streets of New York would witness such an upturning as they have never yet seen. The remedy would be worse than the disease.

What the outcome of the whole matter will be it is not easy to say. The present most advisable course would seem to be the establishment of numerous ventilating stations. A minimum excess of pressure might be assigned that should be maintained throughout the entire system. This could be made so low that the few open manholes would not affect it. Then, when the subways were safe, the gas companies as the originators of the trouble could be made the topic for after consideration.

PROGRESS OF OCEAN STEAM NAVIGATION.

A very interesting contest showing the comparative speeds of some of the latest and best examples of passenger steamships took place recently on the route between Liverpool and New York. Three of the greatest steamships started from Liverpool on the same day for New York. These were the City of New York, built in 1888, the Teutonic, a brand-new vessel, this being her first voyage, and the City of Rome, now eight years old. We present a table giving chief dimensions of notable Atlantic liners:

	Built.	Tons.	Length.	Beam.	Depth.	Indicated H. P.
			ft. in.	ft. in.	ft. in.	
*Great Western....	1835	1 340	212 4	35·4	23·2	—
*Great Britain. ...	1841-3	3,500	274·2	48·2	31·5	—
†City of Glasgow..	1850	1,600	227	32	24	—
†Britannic	1874	5,004	455	46	34	—
†City of Berlin.....	1875	5,491	488	44	36¼	—
†Gallia.....	1879	4,809	430	44	36	—
†Arizona...	1879	5,147	450	45 2	37½	6,300
‡Servia.....	1881	7,392	515	52	40¾	10,300
‡Alaska...	1881	6,932	500	50	39 7	10.500
†City of Rome.....	1881	8,141	546	52	58¾	11,890
‡Aurania	1882	7,269	470	57	39	8,500
†Oregon.....	1883	7,375	500	54	39¾	—
‡America.....	1884	6,500	432	51	37½	7,354
‡Umbria & Etruria.	1884	7,718	501·6	57·2	38 2	14,321
‡Salle.....	1885	5,381	455	48	36 3	—
‡Lahn.....	1887	5,661	465	49	36½	9,500
‡City of New York. and City of Paris.	1888	10,500	560	63	43	20,000
‡Teutonic...	1889	9,685	582	57·6	42	17,000

NOTE.—Those marked * were built of wood, † of iron, and ‡ of steel.

The City of New York and the Teutonic have twin propellers.

The City of Rome has a single propeller and but little more than half the power of the New York and the Teutonic.

All three ships left Queenstown on August 8. The New York arrived at this port first, making Sandy Hook on the 15th inst., in 6 days, 14 hours, 20 minutes. The Teutonic arrived not quite half an hour later. Her time was 6 days, 14 hours, 45 minutes.

The daily runs compare as follows in nautical miles or knots:

CITY OF NEW YORK.		TEUTONIC.	
Date.	Miles.	Date.	Miles.
Aug. 9.....	408	Aug. 9.....	394
" 10.....	440	" 10.....	404
" 11.....	452	" 11.....	430
" 12.....	424	" 12.....	431
" 13	404	" 13.....	440
" 14.....	485	" 14.....	454
" 15.....	197	" 15.....	227
Total.....	2,790	Total.....	2,780

The Teutonic was obliged to slow down for seventeen hours on account of fog. The City of New York was delayed by fog and the heating of her machinery. The delays were pretty evenly balanced.

It is to be noted there was a gain every day in the speed of the Teutonic, which seems to have been in proportion as her new machinery worked easier.

On the other hand, the New York appears to have been pushed for all she was worth, as she had frequently to slow down, owing to the heating of journals.

The City of Rome arrived at Sandy Hook at 2.40 p. m., Aug. 15, having been about 17 hours longer making the voyage than the other two ships.

Considering the great superiority in the machinery of the new vessels over the City of Rome, the gain in speed during the past eight years, though important, has only been attained by an enormous increase of engine power and corresponding consumption of fuel.

SECONDARY BATTERY SUB-STATIONS.

The system of electric lighting by storage batteries, now being tried in Chelsea, England, while not wholly novel, having originated here, is nevertheless a notable one, possessing as it does important advantages over the earlier systems of lighting by storage batteries. By its employment that steadiness and certainty which the most advanced system of feeding directly from the dynamo to the light will not assure is obtained, and yet without the expense of supplying batteries to every patron. Powerful secondary batteries are placed in the sub-station instead, where are also steam engines and dynamos for recharging houses and offices, thus requiring no other fixings than are called for in the ordinary systems. Mr. W. H. Preece, the English electrician, who recently examined the practical working of the new system, says it is possible to construct a long main circuit of small service wires, with a current "of high E. M. F., which at different points can charge a secondary battery of a small number of cells, so as to 'transform' the dangerously high E. M. F. into one of a low and harmless character in the building to be lighted."

Describing the operations of the system, he says: "It distributes its currents to the houses from sub-stations where the batteries are kept, and maintains a continuous supply of electric energy. Each sub-station, of which there are three, supplies current for 2,000 30 watt 10 candle power lamps. There are 265 31-L cells, divided in two sets of groups of 53. Each set is charged separately and alternately in series from the central generating station. While one set is being charged the other is supplying currents to the consumer. The main charging current of 60 amperes has

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an E. M. F. of 500 volts per distributing station, or 1,500 volts for the circuit, and the secondary discharging supply into the houses has a pressure of 100 volts."

Here, as will be seen, the advantages of secondary battery service are obtained, yet without any batteries on the premises of the consumer and without the large outlay which such a service demands. A primary advantage of battery service is steadiness.

In mathematical ratio it gives out its energy, little or much, according as is the demand; being constant to the last moment of effectiveness and unvarying when the process of recharging is regularly maintained, as in these Chelsea lighting stations. Night and day it is the same with the lamps, not being affected by every slight mishap at the central station, as is the case where the energy of the steam engine, transformed into electricity by the interposition of dynamos, is transmitted directly to the lamps. Indeed, the wire connection between central station and lamps may be broken and remain so for hours, yet there is no diminution of intensity in the light, no change. A constant and varied current like this adds, so it has been found, to the life of the lamp, investigation long since showing that lamps of a maximum life of 900 hours lose, on the average, from 20 to 30 per cent of vitality when fed with a varying current. Another advantage is in the low E. M. F. maintained, no danger to life attaching to its use.

It must be said against this ingenious system of light distribution that, though not by any means as costly as that necessitating batteries in every house, it is not so economical as the direct supply system. Not much more than 65 per cent of the power applied in charging the battery can be recovered in effectiveness, and from this must yet be subtracted a not inconsiderable amount for depreciation.

Quite as much, indeed more, might have been said once about electrical systems which now are highly economical. Experimentation and study will, no doubt, increase the efficiency of the secondary battery, which, as an agent of power, has no rival in point of convenience. The smoke and dust of the steam engine, the buzz and vibration of the dynamo, may be afar, and yet the potency of the secondary battery remain, requiring only a connection by wire for recharging.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

The Paris Exhibition.

THE STATIONARY ENGINE EXHIBITS.

PARIS, August 1, 1889.

The first thing that strikes an American engineer with reference to the stationary engines in the Palais des Machines is the slow piston speed of the French and Belgian engines as compared with American practice. The other exhibits of stationary engines possess the same feature, but they are not sufficiently numerous to entitle them to any partcular attention. That class of engine in which a Meyer valve gear or a gear having a riding cut-off valve, or separate expansion valve, as it is termed here, appears to have gone out of use, as has also the common D slide valve engine, save for small engines, as say up to 15 horse power. The wheel governor engine has not found the favor here that it has in the United States, if the French, Belgian, and Swiss exhibits are representative of the practice of these countries. The Armington & Sims (Providence, R. I.) wheel governor engine has found a great deal of favor in England for electric lighting purposes, but there are no stationary engines of any design in the English exhibits in the Palais des Machines, the principal exhibit in this line being a traction engine of very creditable design and workmanship. The engines driving the electric light installation outside the Palais des Machines has a fixed eccentric for the steam admission valve and a wheel governor for the cut-off valve, but the piston speed is not what we would expect in the United States from an engine having a wheel governor.

The Corliss engine entirely rules the roost here so far as number is concerned, and as one passes by engine after engine of this type among the exhibits of various countries, he is brought to a realizing sense of the great achievements of that eminent and representative American engineer George H. Corliss, who was the father of a distinct type of engine and not a copyist in any sense of the word. Even his engine frame was an original idea and one that is very much in evidence in the exhibits from all countries. As I stood to-day looking at a fine example of a Corliss engine, I could not help thinking of a paragraph I read some few years ago in John Bourne's catechism of the steam engine (which may claim, I believe, to be one of the most successful technical books of modern times). It was to the following effect, but I do not remember the exact words:

"Q. What is a Corliss engine?

"A. An engine with a lot of useless mechanism in its valve gear."

The fact was that he, like many others, failed at first to grasp the full significance of Corliss' great invention. There are of course some modifications of the Corliss engine among many of the foreign exhibits, but they are all definable under the heading of engines with releasing valve gears, of which Corliss was the father.

In the examples of Corliss engines pure and simple I find some in which four arms are employed instead of a wrist plate, but I do not think much of this substitution. The arms are of course lighter than the plate, but they look spider legged in the first place, and in the second I doubt if the holes can be made as true because of the difficulty of holding such a weak casting without springing the arms. Of course the arms may be set after being bored or even after the pins are in, but this requires skillful and careful workmanship and is expensive, and even then it would take but little to set them out of true again. On these engines there are various forms of trip motions, some of which are rather complicated.

Two French firms exhibit engines under the patents of Jerome Wheelock, of Worcester, Mass., and as examples of engines with releasing mechanism they are unsurpassed; the simplicity, the ease of handling, the compactness without crowding, and the efficiency of the Wheelock gear place it in the foreground of engines with a marked individuality and originality of design. There are but three representative engines in the American section of the Palais des Machines, viz., the straight line engine by Professor Sweet (Syracuse), the Brown engine (Fitchburg, Mass.), and the Armington-Sims engine (Providence, R. I.) The first is a 100 horse engine having some recent improvements in it, and is the only representative of high piston speed American engines. It attracts a good deal of attention, not only on account of its piston speed, but also for its novelty of design, in which the framing and all parts that resist strains are straight and in the same lines as the strains. When a frame has a bend or curve in it, it compels a strain that would go naturally from the point of departure to the point of resistance to pass around a corner in its passage, and, from the weakness of the frame, deflection, to a certain extent, is inevitable. So perfectly has this idea of resisting strains of metal exactly in line with the strains been carried out by Professor Sweet that he has had engines running, I am told, under load without being secured to any foundation, and the movement on the flooring was too slight to be of practical moment. The engine exhibited is bolted to the foundation at the crank end only, the cylinder end simply lying free in its foundation, but you could not tell this from the running of the engine.

The Brown engine is essentially the same as it was when illustrated in the SCIENTIFIC AMERICAN, and is the best example of stationary engine having a cam motion in the exhibition.

The Armington-Sims engine is driving the dynamo for the electrical welding process. It is of the well known type, having a very ingenious valve motion that is original. The employment of two eccentrics (one within the other) for shortening the valve travel to regulate the point of cut-off was a new motion when the Armington-Sims Company brought it out. The method of double porting the piston valve was also new, ingenious, and simple.

Many of the French and Belgian engines have what may be called a double frame, consisting of a part of a Corliss frame mounted on a separate bed. An idea of the construction may be had by supposing a Corliss bed to be cut off at the end of the crosshead slide and bolted to a bed which carries the pillow blocks or pedestals for the crank shaft. I cannot see where they get an equivalent for the increased quantity of iron in this construction.

Throughout the details of construction there are elements that are anything but pleasing to the eye from a mechanical standpoint, or at least from an American, and in many cases an English point of view, and the more prominent of these I propose to treat in a separate letter, giving sketches, so that the reader may form his own opinions.

The employment of several separate ropes running in grooves on a flywheel, instead of having a wide leather belt for the transmission of power from the engine to the shaft, appears to be quite successful, the grip of the ropes in their V-shaped grooves (even when the driven pulleys are of comparatively small diameter in order to increase the shaft revolutions sufficiently above that of the engines) being sufficient to render it immaterial whether the tensions on the various ropes are equal or not. I noticed one flywheel pulley having 8 ropes (each about 1¼ inch diameter), one of which was very slack, having a good deal of belly to it, and I made a mark on it and its neighbor, both marks being in line, and half an hour afterward I found the marks still in line, evidencing that the slack rope had not slipped.

The taper of the connecting rod keys in the French, Belgian, and Swiss engines is very much less than is usual in either American or English practice, and this makes it more difficult to obtain an exact adjustment of the fit of the brasses to the journals. I am well aware that the exact opposite is often supposed to be the case, but I hold to my opinion nevertheless, and will quote the following as bearing me out.

Some years ago a correspondent of the SCIENTIFIC AMERICAN who was in charge of a vessel wrote to say that he found it very difficult to properly adjust the connecting rod brasses of his engine so as to prevent a knock or pound, or on the other hand to prevent heating of the journal and brasses. In reply to a request, he sent a sketch of the rod end, and it was found that there was very little taper on the key. He said in his letter that if he merely pushed the key home with his hand, the bearing would heat. He was duly advised to put in a new key and gib, with more taper on the key, and wrote about six months afterward, saying that he had no further trouble.

The Cie. de l'Horme (Loire) exhibit an engine with a turning gear for moving the flywheel around when there is no steam on the engine. The gear consists of a screw and worm, the wheel being about 22 inches in diameter. The worm is operated by a ratchet operated by a hand lever. This construction, which is expensive for its purpose, is not found necessary on engines in the United States that are very much larger and have very much heavier flywheels than the engine having this turning gear.

On other engines there is a ratchet cast inside the flywheel rim, and a pawl and lever is used to turn the engine, a similar construction having been employed by Ericsson on the large sizes of his hot air engines made in the United States. But in the case of a stationary engine it is so easy to stop it in the right position for starting again that a turning gear is not found to be necessary upon engines of ordinary sizes.

The crank-pin oiling device brought out originally by the Buckeye Engine Company, of Salem, Ohio, and exhibited by them at the centennial exhibition, is in use here quite largely in its original form, that is, without the stand, which, however, will doubtless soon find its way here.

On a pair of engines exhibited by the Society Suisse (Winterthur), I notice the nuts are chamfered on both sides—a plan that looks bad, because the nuts never seem to bed properly, and one cannot see if they do or not. If the marks left on the cylinder corner faces by the corners of the nuts are considered unsightly, it is better to use washers beneath the nuts, and, in fact, washers look more mechanical than bare nuts anyhow.

Of the workmanship of the Belgian, French, and Swiss engines, as well as those of Alsace, one can hardly speak too highly, especially of the first named. The fits are close everywhere, the curves true and without waves, the joints true and even. It is all hand finished and delightful to the mechanical eye. I very much doubt if such samples of workmanship can be found anywhere else, or indeed anything approaching them.

The finish is also superb. It is not the bright finish of the burnisher, but that of the dead smooth file supplemented by the finer and finest grades of emery cloth, more worn as the finishing proceeds, until the final piece is glazed with a coating of metal. This class of polish shows the correctness of draughtsmen in coloring the parts of a drawing that represent wrought iron blue, for under polish the iron looks distinctly and decidedly blue.

JOSHUA ROSE.

Photographs of Lightning Flashes.

In our number for August 3, we gave illustrations of some remarkable lightning flashes, seen in Iowa, and by an inadvertence omitted to state that the original photographs were taken by Mr. George E. Davis, of Dubuque, an amateur photographer of skill and experience. Mr. Davis states he will be able to furnish a number of duplicates of the photographs at a nominal cost. They are among the finest examples of lightning photos that have come under our notice. The wood engravings of course give little or no idea of the vivid and peculiar effects realized in the photograph.

"IN building a planing mill," says C. E. Tompkins, author of "The Planing Mill," "never forget that time is money, and have careful and accurate plans made, locating each machine exactly where it should be to give the least handling of the lumber. Where the lumber is to pass from one machine to another, arrange the machines so that when it has passed through one it is delivered convenient to the other, without carrying. Then, again, take all possible precautions against fire and dust explosions. It is not only the duty, but it is greatly to the advantage, of every mill owner to inform himself concerning the most effective device to secure the safety of his mill, and to allow no niggardliness to prevent his securing the same."

The advice above, relative to treating the machinery so as to avoid unnecessary handling of the lumber, applies equally well to the locating of machinery for other purposes, so as to avoid unnecessary handling of the products as much as possible.

IT is said that rats are so fond of sunflower seeds that they will, if plenty, flock into the wire cage kind of a trap in such quantity as to nearly fill it. But they should be fed awhile on the seed before introducing the trap.

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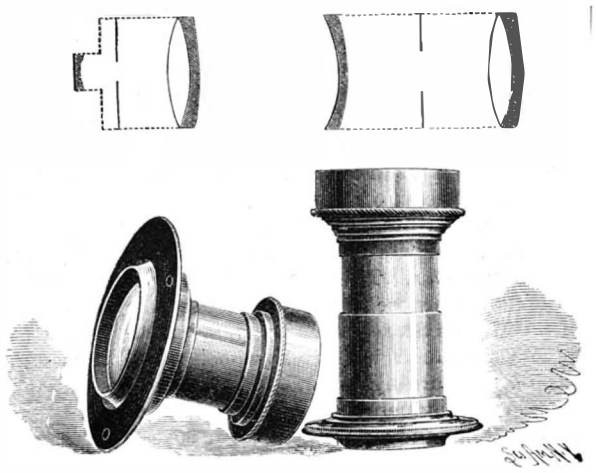
AN IMPROVED LENS.

The accompanying illustration represents a lens in which the intensity of light will be equal throughout the entire field, and the sharpness of the image uniform, being designed for use both for portraits and views, and adapted for telescopic, microscopic, and

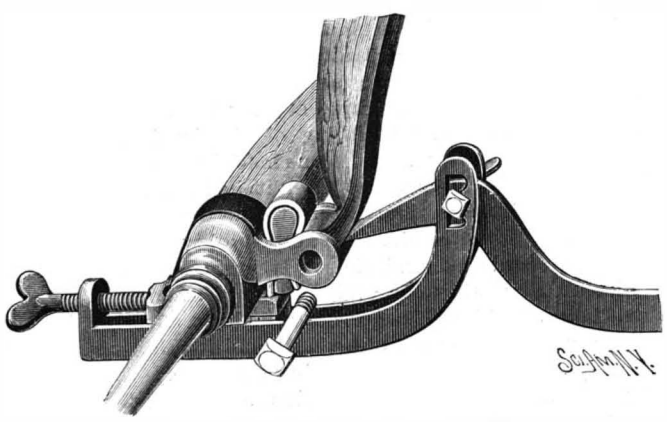


KROGMANN'S PHOTOGRAPHIC LENS.

other uses where an achromatic objective is required. A patent has been allowed on this invention to Mr. Charles H. E. Krogmann, of Nos. 2245 and 2247 Spring Grove Avenue, Cincinnati, O. The figure to the right represents a longitudinal section of a photographic lens tube constructed according to the invention, the figure to the left showing a modification, and the bottom figures showing different mountings. In the rear of the tube is an achromatic lens formed of a double convex lens, and a meniscus concave lens of flint glass, the two lenses being connected together in the usual way, and in the front of the tube is a single meniscus concave lens of crown glass, a diaphragm being arranged between the lenses to screen off some of the marginal rays. In the modified form of this lens the construction is substantially the same, except that the front lens is a small single plano-concave lens of crown glass, and the diaphragm has a smaller aperture, a shorter tube being used with this form. The inventor styles this lens an electroscope, claiming that it represents an electric light battery, in which lenses of different focus represent negative and positive elements and take the place of the two electrodes of the battery, the atmosphere serving as conductor.

AN IMPROVED THILL COUPLING JACK.

The accompanying illustration represents a device to facilitate the attachment of the thills to the axle, against the tension of the anti-rattler spring. It has been patented by Mr. James M. Smith, of Greenwich, Conn. The device consists of a strap-like clamping frame having an adjustable screw in its rear end, the screw being fitted with a loosely attached bearing block, faced with suitable material, so as not to mar the paint on the surface against which it bears. This screw adjusts the jack to different sizes of work, and when in position its block bears against the rear side of the axle or clip. The operating lever of the jack is fitted to work within upturned arms of the clamping frame, with which it is connected by a fulcrum bolt capable of adjustment up or down in a slot in each of the arms, and resting in notches therein, a thumb nut holding the bolt in position as adjusted. The operating lever is suitably bent to provide for its easy manipulation, and its inner end is made chisel-shaped where it bears against the thill when the jack is applied to compress the rubber and spring by pressing upward on the outer end of the lever. This brings the joint hole of the thill in line with the joint hole of the coupling for the insertion or removal of the pin. A single movement of the lever



SMITH'S THILL COUPLING JACK.

serves to keep the jack to its hold without the necessity of a continued pull of the lever, which automatically locks itself and holds the thill in position for inserting or removing the coupling pin.

THE principal medical periodicals of the world are about 266 in number, of which 174 are published in the United States and 92 in all other countries.

The Horn Snake Myth.

F. F. B., of Poplar Mount, Va., sends the SCIENTIFIC AMERICAN a long description of a wonderful snake-like reptile killed by a resident of Greensville Co., Va. The strange creature is said to have had "a cow's horn tip to its tail, which contained a sharp sting." But after giving the startling description our correspondent ends by saying, "I did not see the snake myself, but got these facts from the man who killed it." Thus it is with all horn snake stories that have come under our notice; they all end in "I was told so."

Large rewards have been offered for specimens of a snake with a poisonous sting in its tail, yet notwithstanding the stories that "the woods is full of 'em," not a single individual has yet been captured.

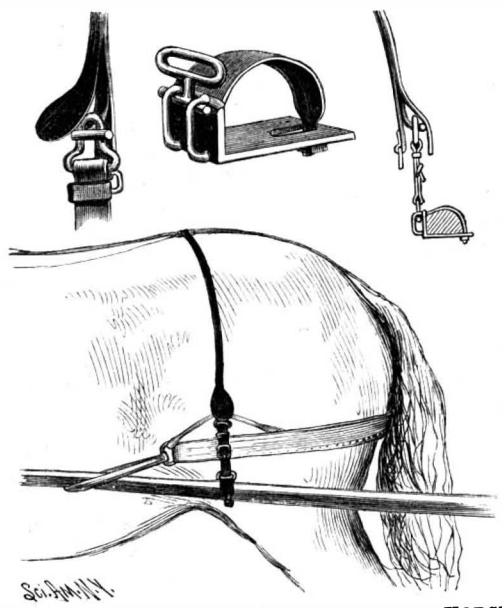
Specimens of the red-spotted black snake, *Farancia abacura* of Holbrook, and of the *Abastor erythrogrammus* of Daudin, have been taken in North and South Carolina, labeled "horn snakes, very poisonous," and sent to museums and collectors in the North. That the tails of these serpents do end in a horny tip is perfectly true, yet I need not add, they contain no sting nor venom apparatus of any description, and the serpents are harmless in every way. The sting-tailed horn snake is a myth.

The little black snake described by F. F. B. is the ring-necked snake, *Diadophis punctatus*. It is common in many localities from Maine to Florida.

C. FEW SEISS.

AN IMPROVED SAFETY HARNESS.

An attachment specially designed for single harness, to serve for the subjection of vicious horses and for the breaking of colts to work in harness, is illustrated herewith, and has been patented by Mr. Robert M. Reid, of Ann Arbor, Mich. A rod having at each end a T is passed through the harness back strap and over the rump of the horse. On each T hooks the end



REID'S SAFETY HARNESS FOR VICIOUS HORSES.

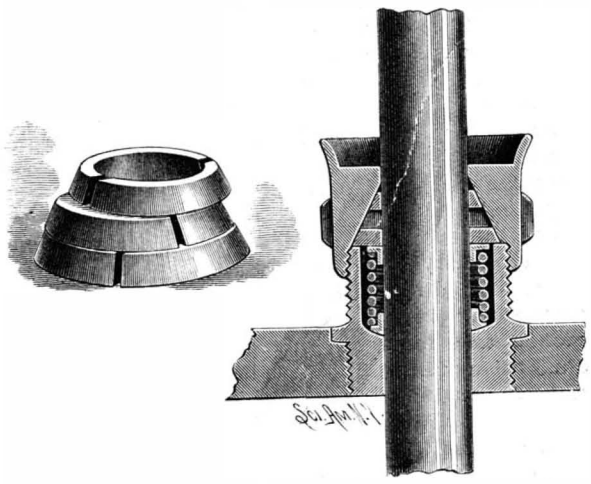
of a link having a laterally extending part, in which is buckled a strap connected at its lower end with a link by means of which a clip is suspended. This clip is shown in the middle figure at the top in the illustration, the mode of its attachment being shown in the side views. The clip has a bottom plate, to bear on the under side of one of the shafts, and on its upper side is a metallic band adapted to pass over any sized shaft, and be held in engagement therewith by a screw nut, the lower end of the band being formed into a threaded bolt, and passing through a slot in the bottom plate of the clip. The link by which the clip is connected with the leather-covered rod acting as the rump strap of the breeching may be readily attached or detached, and on the hooking of the link, the clip having been fastened to the shaft and the straps adjusted as desired, the animal is prevented from kicking, as any upward motion of the hind feet would necessitate the lifting of the shafts and part of the vehicle.

How the English Encourage Steamer Lines.

Messrs. Anderson, the managers of the Orient line of steamers to Australia, have entered into a contract with the Canadian government to provide a weekly service of express steamers between England and Canada. The subsidy is $500,000 yearly, and the steamers are guaranteed to be of 19 knots speed and to complete the passage within six days. They will sail from London for Cherbourg, making Plymouth the final port of call before steaming away for Montreal or Halifax. The steaming time will be taken from or arriving at Plymouth, which will be the first and final port of call. It will be fully twelve months before the arrangements are sufficiently complete to permit of the service being started. It is stated that this route has been started in conjunction with the Canadian Pacific Railway.

AN IMPROVED PISTON ROD PACKING.

A metallic piston rod packing, designed more particularly for piston rods of steam engines, steam pumps, etc., is illustrated herewith, and has been patented by Mr. F. G. Kellogg, of Brainerd, Minn. In the cylinder head screws a box with a central aperture for the pis-



KELLOGG'S PISTON ROD PACKING.

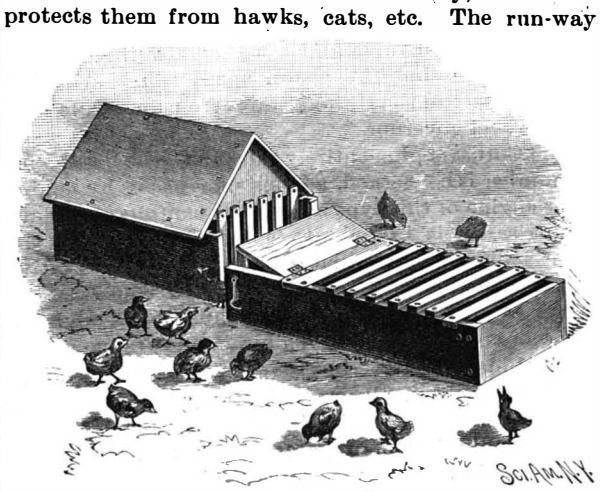
ton rod, the outer end of the box having an enlarged central opening on which screws a head having on its upper end a cup in which to place the lubricant. The bottom of the box is concave, and into it fits a ring with an upwardly extending annular flange fitting closely against the piston rod, a coil spring resting on the ring and carrying at its upper end a flanged ring pressing against the under side of one of a series of packing rings fitting into a conical aperture in the outer head. The small end of this aperture is of the same diameter as the piston rod and opens into the oil cup. The packing rings, as shown in the small view, have their peripheries inclined to correspond with the conical opening, and they are made in sections, the several rings being arranged one above the other so as to break joints.

Useful, if True.

Some one has made the discovery, or rather makes the assertion, that a fly always walks upward. Put a fly on a window, and up he goes toward the top; he can't be made to walk downward. So an inventor has made a screen divided in half. The upper part laps over the lower, with an inch space between. Well, as soon as a fly lights on the screen, he proceeds to travel upward, and thus walks straight out doors. By this means, a room can be quickly cleared of flies.

AN IMPROVED HEN COOP.

A hen coop and run-way especially designed to facilitate the breeding of young chickens has been patented by Mr. E. Butterick, of No. 406 Franklin Ave., Brooklyn, N. Y., and is illustrated herewith. The main or covered portion of the coop has a slatted front and rear flap door for the admission of the hen, the run-way at the front having its sides at their inner ends overlapping the sides of the coop, so that the run-way and coop may be set at different inclinations without causing an open joint between them. The run-way has a vertically swinging door to incline against the front of the coop, and prevent rain from driving through its slatted part, while also facilitating the feeding of the chicks. The bottom of the coop has removable boards, whereby more or less of the ground may be exposed. With this coop and run-way, the hen may be kept in place while the chicks are allowed the benefit of sun and exercise inside the run-way, which also protects them from hawks, cats, etc. The run-way



BUTTERICK'S HEN COOP.

may be readily removed from the coop, allowing the little chicks the desired liberty, and one hen will with this coop and run-way take care of a number of broods.

IN the patent suit of A. L. Ide & Son against the Ball Engine Company, of Erie, Penn., for infringement of use of dash pot in flywheel governor, Judge Blodgett, of Chicago, on July 22 handed down his opinion in favor of the Ball Company.

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THE SCIENTIFIC LANTERN.*

In lantern projection, as in all other scientific work, the best results can be obtained only by employing the best means. While a cheap lantern may have considerable utility, it cannot fully satisfy modern requirements in the line of scientific projection. In Fig. 1 is illustrated a lantern which is adapted to all kinds of projection, and which may be readily shifted from one kind of work to another. It is provided with an oxyhydrogen burner and with an electric lamp, either of which may be used at pleasure. It may be very quickly arranged as a vertical lantern, and all of the attachments are constructed so that they may be placed at once in the position of use without the necessity of alignment and adjustment in each case.

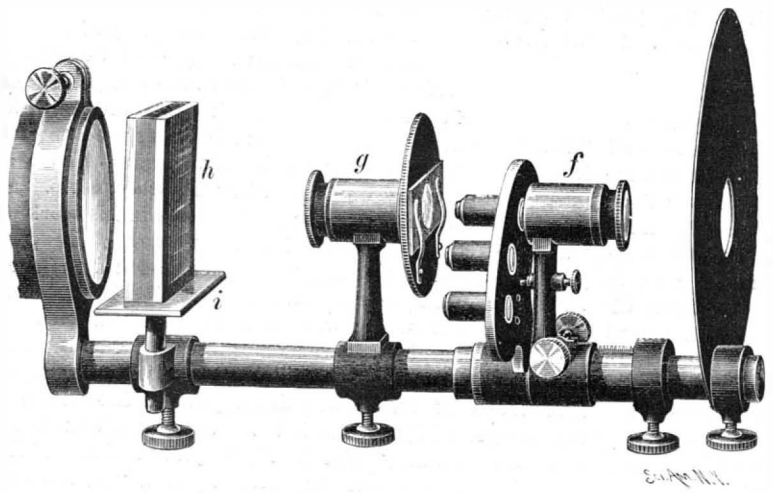

Fig. 2.—MICROSCOPE ATTACHMENT.

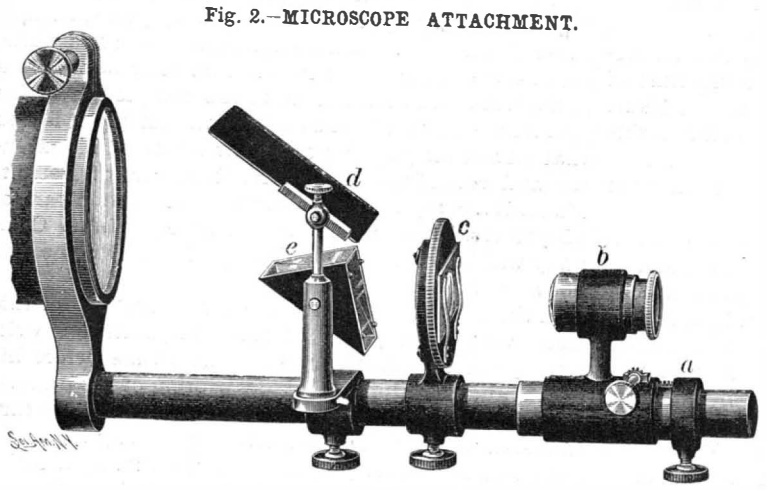

Fig. 3.—LANTERN POLARISCOPE.

The frame of the lantern consists of cast iron end pieces having rectangular legs attached to the base. To the sheet iron top is attached a tall chimney, having a cowl at the upper end for confining the light. Opposite sides of the upper portion of the frame are provided with hinged sheet iron doors. The lower part of the lantern frame is provided with hinged removable doors, which may be used to close in the light.

The front is furnished with a plate hinged to swing in a vertical plane, and provided with a cell for containing the outer lens of the condenser. The axis of this lens cell coincides with that of a similar cell supported by the front end piece of the frame and containing the inner lenses of the condenser. The inner lens of the condenser is a plano-convex 4 inches in diameter and of 8 inch focus, arranged with its plane side toward the light. The two outer lenses are plano-convex, 5 inches in diameter and 8 inches focus, arranged with the convex faces adjoining. The distance between the lenses is ⅛ inch. The combined focal length is about 2 inches, measured from the plane face of the rear lens.

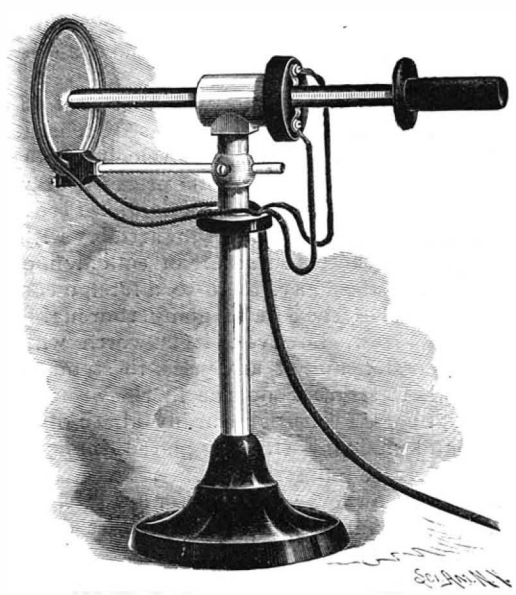

Fig. 7.—ARRANGEMENT OF ELECTRIC CANDLE FOR LANTERN USE.

Prof. A. K. Eaton, of Brooklyn, has devised a condenser in which the inner lens is a meniscus and the outer and larger ones are crossed lenses. It is used in many scientific lanterns and is very effective.

The outer or movable lens cell projects beyond the hinged plate, and receives a split ring provided with a shallow internal groove, which fits over a corresponding circumferential rib on the lens cell. This split ring has a tangent screw for drawing it together, so as to cause it to clamp the lens cell. It is also furnished with an ear, into which is screwed a bar parallel with the axis of the lens cell. To this bar are fitted the slide support, the supports of the projecting lenses, the apparatus for microscopic projection, the polariscope, the adjustable table for holding tanks, pieces of apparatus, etc.

As represented in Fig. 1, the lantern is arranged for the projection of pictures, diagrams, and such pieces of apparatus as will go in the place of an ordinary lantern slide. The objective is a one-quarter portrait lens of good quality. For the support of tanks and other vessels for projection, the table shown in Fig. 2 is used in place of the slide holder.

The attachments shown in Fig. 2 are employed for the projection of microscopic objects. The engraving shows the polariscope in place; but this may be removed by simply taking the short tubes which contain the prisms of the polarizer and analyzer out of the sleeves, *g*, *f*. The stage is arranged so that it may be revolved either with or independently of the polarizer, and the latter may be revolved independently of the stage. The objectives are supported by a movable plate, which swings so as to bring either of the objectives into the position of use. A small conically-pointed spring bolt locks the plate in either of its three positions. When it is desired to use a larger objective, the plate may be swung below the supporting bar, when the objective may be inserted in the sleeve, *f*. This arrangement admits of applying a system of lenses for wide-angled crystals.

In the projection of microscopic or polariscopic objects it is advisable to always interpose the alum cell or water tank, *h*, between the condenser and the Nicol prism or the object, to intercept the heat, and thus prevent injury to the prism or object.

The table, *i*, which supports the tank, *h*, is made adjustable as to height to accommodate different objects or pieces of apparatus. In front of the microscope attachment is supported a centrally apertured disk, which prevents stray light from reaching the screen.

The sleeve that supports the objective holder and the sleeve, *f*, slides on the tube, *a*, fitted to the support bar, and is provided with a pinion which meshes into the rack on the tube, *a*. By means of this pinion the objectives, together with the sleeve, *f*, are moved out or in for focusing.

In Fig. 3 is represented a polariscope for large objects, which is constructed according to the plan of Delezenne, but modified by the writer so as to utilize a right-angled totally reflecting prism, such as is used for presenting objects right side up on the screen; also for throwing the beam horizontally from the vertical attachment, as will be described later on.

The black glass polarizing mirror, *d*, is arranged at the polarizing angle in the path of the cone of light proceeding from the condenser. Below the mirror, *d*, is supported the right-angled prism with its reflecting side parallel with the mirror, *d*. The beam of light thrown downward by the black glass is thrown forward by the prism. A revoluble stage, *c*, and a tube, *d*, containing an objective and analyzing prism, are supported with their axes coincident with that of the light beam proceeding from the prism, *e*. Focusing is effected as in the other case. This arrangement is particularly adapted to the projection of designs in selenite or mica, mica cones, semi-cylinders, and specimens of strained glass.

There is an inappreciable loss resulting from the angle formed by the 90° sides of the prism with the incident and emergent beams. The polarizer works very perfectly, and costs only a small fraction of the amount required to purchase a Nicol prism of the same capacity. It cannot, of course, be revolved; but the object and the analyzer can be turned, which is sufficient. Very good results can be secured by employing a plane mirror in place of the reflecting prism. The bar which projects from the front of the lantern is made in two sections, connected by a close-fitting bayonet joint.

For such objects as must lie in a horizontal position when projected, the hinged plate which supports the outer half of the condenser is raised into a horizontal position, and a triangular casing containing a mirror is placed underneath it. The attachment is provided with short studs, which enter the front of the lantern and the hinged plate, and hold it in position. The reflecting prism (Fig. 5), or a plane mirror, is placed over the object to direct the light to the screen.

The improvements in the lantern and the attachments thus described are the result of a long experience with lanterns of various kinds. It is believed that it fulfills most requirements. It can readily be adapted to all the uses for which a scientific lantern is required.

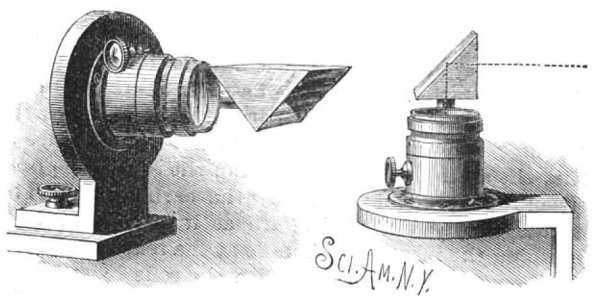

Fig. 5. Fig. 4.

APPLICATION OF THE 90 DEGREE PRISM.

To prevent the escape of stray light a wire frame is attached to the body of the lantern, so as to support a black cloth canopy, which covers the entire front of the lantern and extends downward below the support bar. It is provided with an aperture in front for the passage of the projected beam. In addition to this protection, the larger objectives may be provided with disks like that shown in Fig. 2. These precautions in regard to the escape of light are particularly necessary in microscopic and polariscopic projection, which require a thoroughly darkened room. In the projection of plain microscopic objects, it is found advantageous to place a plano-convex lens of three-fourths inch focus behind the stage.

An analyzer, formed of a series of three glass plates,

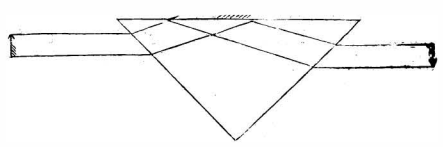

Fig. 6.—COURSE OF THE RAYS THROUGH THE ERECTING PRISM.

and arranged to show both transmitted and reflected beams, is desirable. By a second reflection of the reflected beam it may be combined with the transmitted beam, showing that the reunion of the complementary colored beams produces white light.

In Figs. 4 and 5 are shown two applications of the 90° prism. In Fig. 4 it is shown in position for erecting the image produced by the lantern. The course of the rays is clearly indicated in Fig. 6.

The totally reflecting prism, when used to render the beam horizontal in a vertical lantern, is arranged as shown in Fig. 5; *i. e.*, with one of its faces at right angles to the beam, and with its reflecting face at an angle of 45° with the beam, or approximately so.

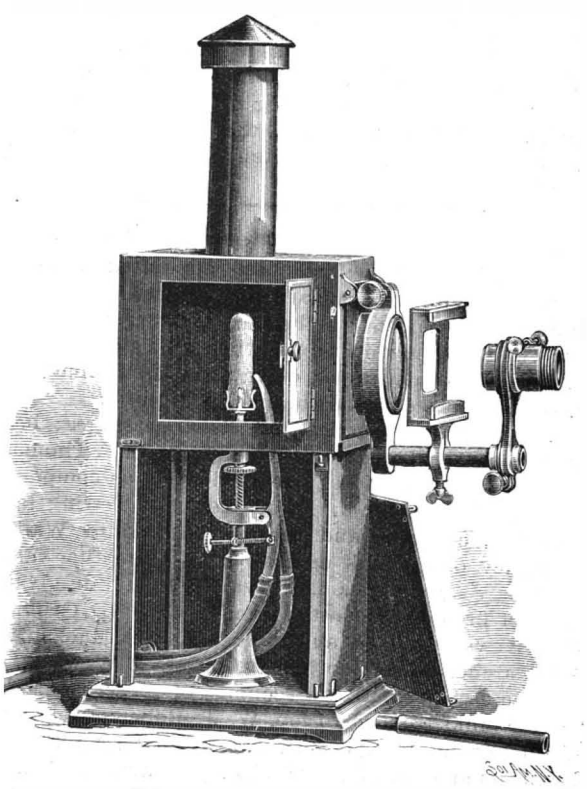

Fig. 1.—SCIENTIFIC LANTERN.

Probably the most desirable source of light for all purposes is the oxyhydrogen or calcium light. The burner shown in Fig. 1 is an excellent one. It is pro-

* From "Experimental Science," by Geo. M. Hopkins, in press. Munn & Co., publishers, New York.

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vided with a platinum-tipped jet and is arranged for every adjustment. The lime cylinder can be revolved and raised or lowered. The jet may be adjusted relatively to the lime so as to secure the best results. As the gases are mixed inside the burner, they should be taken from tanks or cylinders in which considerable pressure is maintained. Gas bags are unsafe when used in connection with a burner of this kind.

In the electric lamp shown in Fig. 7, a Jablochkoff candle is employed. It is superior to the calcium light, and gives very little trouble when an alternating current is available. The carbons being presented end on to the object yield nearly all their light in one direction, so that the loss of light is less than in the case of the ordinary arc lamp. The candle is coincident with the prolongation of the axis of a helix supported near the luminous point. The current that supplies the candle passes through the helix. In consequence of this the arc is drawn to the end of the candle in opposition to its tendency to follow the carbon rods. The candle can be moved forward as it is consumed by grasping the insulating handle at the rear end. Electrical contact is established with the rods by two copper springs contained in the revoluble support of the candle. When a direct current is used, a quick-acting current-reversing switch is required, as in this case the current must be reversed frequently to cause the carbons to burn evenly.

Memphis Artesian Wells.

We have heretofore given a somewhat succinct account of the discovery of artesian wells in this city. We have also given the analysis of the water by Dr. Charles Smart, Major and Surgeon U. S. Army, Washington, D. C.; Prof. J. W. Mallett, of the University of Virginia; Prof. E. H. Bailey, of the Chemical Laboratory of the University of Kansas, all attesting its remarkable purity. The city of Memphis has been enjoying this water now for nearly one year, using from eight to ten million gallons daily, and there are no signs of exhaustion of the wells. The increased demands, however, of a rapidly growing city have rendered it necessary to largely increase the pumping capacity, and in view of this the water company is placing an entirely new plant.

The pump house being constructed will be 75 by 170 feet in dimensions, having two smokestacks of solid masonry, each 13 feet in diameter at the base, 9 feet at the top, and 125 in height. The pumps will set in a dry well, 45 feet deep and 38 feet in diameter, taking water from a well 10 feet in diameter, into which the mains from all the wells will discharge the water to be distributed by the pumps to the great standpipe on Shelby Street and throughout the city. The standpipe on Shelby Street is a grand piece of work, and constitutes one of the features of the artesian water plant. It has been constructed of steel plates 1¼ inches thick and having a diameter of 20 feet, and stands 160 feet above the level of the street. It will contain over 500,000 gallons of water.

Two tunnels are being constructed 80 feet below the level of the streets. The shaft leading to these is navigated by a steam elevator, and the tunnels are traversed by a narrow railway track, over which the visitor may travel. The tunnels are 5 feet in diameter, and cased in brick laid in cement, and will be, when completed, about 3,000 feet long. The water is conveyed from the wells by means of laterals to these tunnels, and by them is carried to the pumping station.

The company is now putting in position, on a foundation that alone cost $30,000, three of the Worthington compound condensing high duty engines.—*Med. Monthly.*

American Railway Master Mechanics' Association.

A list of committees has been appointed by President Briggs, of this association, to collect information and present reports to the next convention of the body on the following topics—the name given in connection with each subject being that of the chairman of the committee on that branch of inquiry:

Exhaust pipes, nozzles and steam passages; best form and size in proportion to cylinders, C. F. Thomas. Compound locomotives; their efficiency as compared with simple engines, J. Davis Barnett. Testing laboratories, chemical and mechanical, Philip Wallis. Efficiency of the link as compared with other valve motions, James M. Boon. Advantages and disadvantages of fire box above the frames, Fred B. Griffith. Relative value of steel and iron axles, John Mackenzie. Brick arches in locomotive fire boxes, T. W. Gentry. The best means and the economy of preserving locomotive tanks from corrosion, W. J. Robertson. Purification or softening of feed water, W. T. Small. The best form and size of axles for heavy tenders, W. Swanston. The present status of the "automatic car coupler question," and whether the association can indorse the action of the Master Car Builders' Association in recommending the vertical plane type as a standard, from a mechanical standpoint, John Hickey.

The rooms of the association are at No. 140 Nassau Street, New York City, Angus Sinclair secretary.

Frederick J. Seymour.

An account of the recent death of the metallurgist Frederick J. Seymour, at Findlay, Ohio, coupled with the statement that with him perished a secret for making aluminum, has been going the rounds of the press, and although containing many erroneous statements, has awakened widespread interest, particularly as at present the production of this wonderful metal is absorbing a great deal of attention from scientific men, and as through the discoveries of quite recent times the cost of aluminum is being so constantly reduced as to rapidly bring it within the reach of usage for industrial purposes. In 1854 aluminum was rated at $15 per *ounce*. It is now sold for less than $5 per pound. It must needs be brought far within the dollar mark before it can obtain general use.

The late Frederick J. Seymour was probably one of the best practical metallurgists in the country, as well as an inventor and a mechanical engineer of attainment. It is very little known that the Seymour family, which has produced so many distinguished men for this country, numbering among them Horatio Seymour, of New York, and a number of noted men in Connecticut and elsewhere as governors, judges, divines, and statesmen, are the descendants of Richard Seymour, who came to the colonies somewhat late in their history, and who was one of the younger sons of the noble Seymour family, whose estates and castle are at Berry-Pomeroy, in Devonshire, England, and who trace their ancestry direct to the Duke of Somerset, Edward Seymour, the Lord Protector of England under the reign of Edward the Sixth. Jane Seymour, wife of Henry the Eighth, was of the same family. Beyond this the family origin goes back to the time of the Roman conquest, when the name was St. Maur. The Bible of Richard Seymour, first to come to this country, bearing on its cover the well known family coat of arms, is now in the museum of the Connecticut Historical Society at Hartford, Conn.

The subject of this sketch, Frederick Julius Seymour, was one of his descendants. He was born at Farrington, Conn., October 14, 1824, receiving as good a common school education as was to be obtained at that time. In early manhood, after his marriage with Florentine Migeon, the daughter of a French gentleman who came to this country with Lafayette, and by whom he leaves one son and two daughters, he was placed in charge of one of the rolling mills of the Waterbury Brass Company, at Waterbury, Conn. The production of sheet brass was comparatively in its infancy then. Mr. Seymour filled the position with credit and faithfulness for ten years, and during this period a genius developed in later life led him by study and application to lay the foundation of a wide knowledge of metals that made him a scientific authority in the working of brass, copper, and zinc, and their alloys, as well as the machinery for their development into commercial uses. He was the inventor of many machines for working these metals and the originator of numerous processes, improvements in mixtures, and alloys.

On the breaking out of the war, as first lieutenant Co. C, 14th Regiment Connecticut Volunteers, he was among the first to respond to the call for volunteers. He participated in the Peninsular campaign, and was promoted captain for gallantry at Antietam. Shortly after he was honorably discharged, his health having been nearly wrecked by exposure. Returning, he organized and as president he managed for a number of years the Seymour Manufacturing Company, now the Turner & Seymour Manufacturing Company, of Torrington, Conn., and Chambers Street, New York, manufacturers of metal goods. He was later interested with Hon. L. W. Coe, his brother-in-law, in starting the Coe Brass Co., of Torrington, Conn., now the most extensive brass rolling mills in the world—a company which has supplied European governments with millions of tons of high grade metal for cartridges. Mr. Seymour was also one of the organizers and for a time president of the Union Hardware Company, of Torrington, Conn., and was connected with various other enterprises, to all of which his inventive genius and knowledge of metals contributed to their success. Mr. Seymour was also the constructing engineer of several brass and copper rolling mills, and it would require a volume to chronicle all the results of his busy and restless life.

Two things elementary in his complex character barred him from becoming a famous man. With a brilliant mind, inventive genius, and acute judgment, he lacked commercial instinct. Generous to a fault, he gave away his ideas as freely as his money—alike careless of fame. The wild scramble for gain going on around him in the world was to him a mystery and an unsolved problem to his dying day. Possessed of intense energy and application, so rich was his mind in ideas that, like a child going from flower to flower in the fields, he sometimes failed to complete one idea before the attractiveness of another seized his attention. Careless of pecuniary reward, careless of credit for what he accomplished, his life might be summed up in a very few words, did not every hardware store contain some mark of his inventive skill and the Patent Office contain records of his patents amounting to over a hundred.

For a number of years his laboratory experiments had been very extensive. His attention early called to aluminum, he devoted several years to the subject of its reduction. It is well known that this metal, while the most common on the surface of the globe, is one of the most difficult to reduce. Success meant fame and fortune to the fortunate inventor. The Patent Office records bear to-day sixteen American and six foreign patents granted to Mr. Seymour on this process of aluminum. His experiments early became known, and his reputation as a metallurgist was such that capital was attracted, and a large stock company of $2,000,000 capital, called the American Aluminum Company, was formed before his experiments were complete. In the hands of speculators, the stock was somewhat distributed, every development made being used to give it a new boom. Owing to the advantages of natural gas, the laboratory was located at Findlay, Ohio. As step by step Mr. Seymour met success in his work, it was covered by patents. However, during the past year, he was much hampered by sickness and irritated by having been placed in a false position by boomers and other causes, and while death found him with his process incomplete, it was complete as far as it went, and though he doubtless carried into his grave much knowledge of its future development, the wild stories so generally circulated in the papers throughout the country about high picket fences, the exclusion of workmen at a critical point, etc., have no foundation in fact, except the ordinary precautions to preserve information before being patented; and while, as before stated, except in the fact that doubtless a great deal of information as to the completion of his process went down to the grave with him, yet it is said that among his papers, now in the hands of his executor and son, Mr. Frederick H. Seymour, of Detroit, Mich., is a complete record of the uncompleted part of his process. The present American Aluminum Company will be wound up. What the future will be cannot be told now.

In the SCIENTIFIC AMERICAN SUPPLEMENT for this week we give a paper hitherto unpublished, written by the inventor himself a short time before his death, and containing a full description of his process.

Mr. Seymour's processes were such a new departure in metallurgy as to excite incredulity among metallurgists, and his developments have upset many theories heretofore held concerning aluminum, and some of his claims for his patents appeared so irrational to the experts of the Patent Office that they made a special visit to the laboratory at Findlay to verify them before allowing them, and were then convinced of their truth.

New Arms and Powder.

"After long expectation," says Captain Studor, in the *Allgemeine Schweizerisch Militarzeitung*, "there has appeared a useful type arm, the introduction of which will be welcomed by those who hurried us into arming. But first a word on the commission of arms. Why is there here the universally forbidden copper covering to the bullet? Not copper, but steel and nickel is the proper material for this covering or jacket. In the cylinder four rounds are better than three. The shell might be smaller; and in the magazine, would not six shots be sufficient in time of war? A round dozen is too much, according to our idea. And why is the magazine encumbered with the packet loading? It will bring no advantage, but only confusion. The progress has been great in the development of smokeless powder and in the control of the pressure in the bore. In proof, we give the following surprising results communicated from reliable sources, but, nevertheless, not official:

"Caliber, 7·5 mm. (0·295 in.); weight of shot, 13·1 gr. nickel steel "mantel," shot ungreased; charge, 2·4 gr.; volume of the shell = 3·3 cm.³; velocity, V 25 = 615 m. (2,018 ft. per second); maximum pressure, only 1,300 atmospheres. For a small arm this is almost too much; but what a magnificent prospect for artillery with such a powder! For the manufacture of collodion, or gun cotton, we still, alas! have to go to a foreign country. They are afraid of the cost of going thoroughly into the matter. Now, however, it is worth while, as quickly as possible and at any price, to stand on our own feet. Let us not economize in the wrong place. Of our neighbors, France is naturally ahead of all, yet the German kingdom is strongly placed, thanks to its intelligent private industries; from it has come salvation, now for powder, as earlier for arms, shot, and armor. The stimulus of private enterprise does more for progress than all state commission."

85 Miles in 82 Minutes.

The New York delegation of the Ancient Order of Foresters lately arrived at Minneapolis to attend the National Convention there. They traveled in a special train, and on one part of the journey made the remarkable speed of 85 miles in 82 minutes or at the rate of over 62 miles per hour.

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The Training of Teachers.

At no time has there been a livelier interest among educators in this country concerning the adequate training of teachers for public school work than at present. In considering educational questions the comparative method is always profitable, and in this connection a very brief description of the fitting schools of Germany as observed by the late Matthew Arnold during his third official investigation of public school work on the Continent for the English government may be helpful.

The pre-eminence of school instruction in Prussia for the last half century renders his report unusually suggestive. One of the four points he was instructed to observe during his investigation was the status, training, and pensioning of teachers; and as a type of the training received, the course of a fitting or normal school in Saxony is described. The training course lasts six and may require seven years. As the government (free) schools are not above what corresponds nearly to our grammar grade, the course includes an academic as well as professional course. To the training school is attached a practicing school. In this school the students see and learn the practice of teaching. Their own instruction they receive in small classes which may not have more than twenty-five scholars.

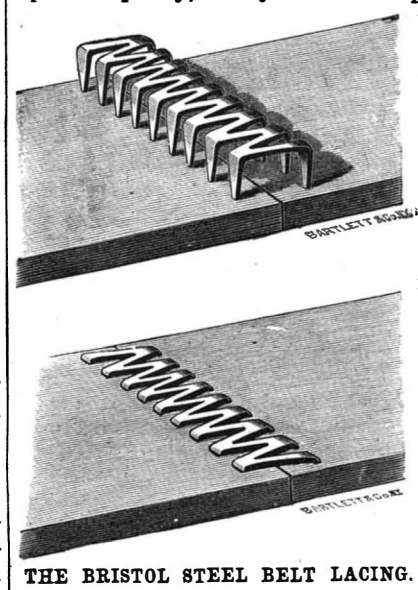
Their hours in class may not exceed thirty-six a week, not counting the time given to music. The matters of instruction are religion, German language and literature, Latin, geography, history, natural science, both descriptive and theoretical; arithmetic, geometry, pedagogy, including psychology and logic, music, writing, drawing, and gymnastics. All of these are obligatory; but, after the first year, students of proved incapacity for music are no longer taught it. One-third of the teaching staff of the training school may be distinguished elementary teachers without university, the remaining two-thirds being university graduates, but this proportion is never to be exceeded. There are half-yearly examinations. The six years may be lengthened by one year for a student who is deemed not ripe for the leaving examination, which comes at the end of the course. At the end of the course the student undergoes examination for office. The examination is both written and oral, and turns upon the work of the student's course in the training school. If the student passes, he receives a certificate of ripeness and is now qualified to serve as assistant in a public popular school, or as a private teacher where his work has not to go beyond the limits of popular school instruction (grammar grade). After two years of service as assistant, the teacher returns to the training school and presents himself for the examination for "definitive posting." This examination is also both written and oral. Mr. Arnold attended such an examination and heard candidates examined in religion, music, German language and literature, the history of education and pedagogy, psychology, logic, and school law. In general, Mr. Arnold remarks that instruction is better in foreign schools, because the schools are better organized and the teachers better trained.

Only such teachers are eligible to positions as possess certificates of graduation from an authorized training school. One can but observe the adequate provision for successful training and note in comparison the need of similar regulations in our own State schools—namely, a uniform, good standard of academic study to precede the training course, the high quality of the training staff, the two years' course of strictly professional study — theoretical and practical, although open to the charge of being impracticable with us. If thoroughness and completeness in the training of teachers are desired, one can hardly forbear the suggestion that two or three, at most, of the most advantageously located of our normal schools could, with greater economy and efficiency, be made to accommodate and prepare for teachers the 1,000 students in attendance at the five institutions. The amount usually appropriated to the five, if divided among the three, would or could be made at once to greatly increase their efficiency of equipment, while in time higher standards, superior facilities, and satisfactory results would bring credit to the State.—*Springfield, Mass., Union.*

THE city of Brooklyn can probably boast of having the largest bread bakery in the world. Seventy thousand loaves a day it usually turns out, requiring three hundred barrels of flour. Three hundred and fifty persons are employed in the bakery, and for delivering the bread in New York, Brooklyn, and adjacent places, over one hundred wagons, constructed for the purpose, are in constant use.

AN IMPROVED STEEL BELT LACING.

A recently patented lacing for leather driving belts for machinery is shown in the accompanying illustration, one of the views showing the lacing placed in position upon a belt to be joined, and the other representing the finished joint after the spurs have been driven through and clinched. This fastener is made of steel, and is designed to afford a smooth and elastic joint, as well as one of great strength. It is easily and quickly applied, without any special tools, the spurs being driven through upon a soft piece of wood, after the ends of the belt to be joined have been brought evenly together. The smooth side of the joint is then laid upon the pulley, or any convenient piece of iron, and the points clinched. These lacings are furnished in lengths varying from one to three inches, by quarter inches, two or more lacings being used for belts wider than three inches. They will undoubtedly prove a great convenience about a machine shop or factory, and save much of the time heretofore expended in lacing belts by the ordinary way. This belt fastening was devised by Prof. W. H. Bristol, of the Stevens Institute of Technology, after a course of experiments to determine the best relation between the width of the spurs and the spaces between them, and some of the fasteners have been in use in work calculated to test their efficiency for the past five months. They are made by the Bristol Manufacturing Co., Waterbury, Conn., or 132 Nassau Street, room 56, New York City.



THE BRISTOL STEEL BELT LACING.

THE WHITE STAR LINER TEUTONIC.

The new steamship Teutonic, of the White Star line, is the first merchant vessel built to comply with the conditions of an Admiralty subsidy. She took part in the recent review of the fleet at Spithead, when she was fitted with four of her complement of twelve 5 inch guns. The guns are to be placed six on either side upon the promenade deck; those in position at the review were fixed at the extremities of the ship.

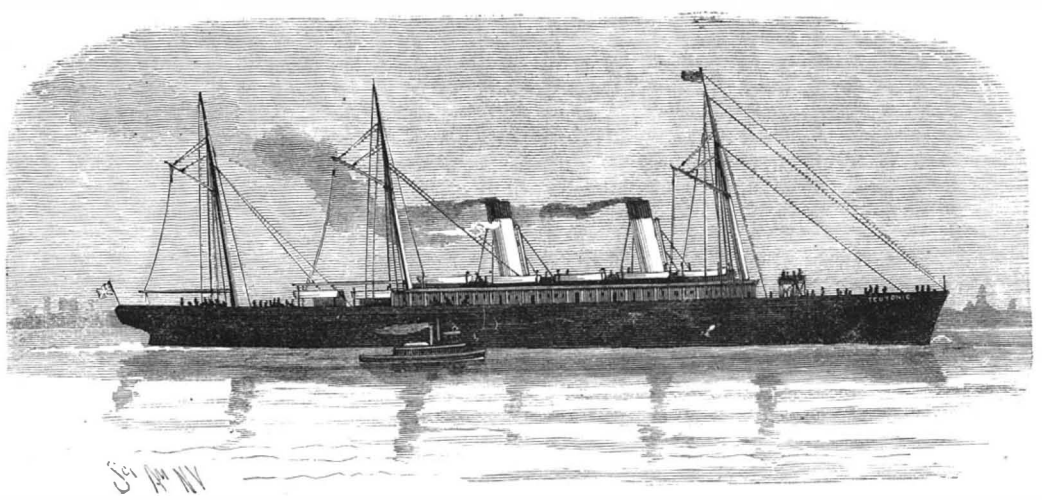
The vessel has been built by Messrs. Harland & Wolff for Messrs. Ismay, Imrie & Co., and, according to the London *Engineer*, may be regarded as absolutely the safest ship afloat. She is fitted with twin screws; and the whole of the machinery, engines, boilers, and coal for working either screw independent completely from its neighbor by a fore and aft bulkhead, which extends from the after end of the engine room to the forward end of the foremost coal bunker, and, in fact, intersects the six largest of the twelve watertight compartments made by the eleven ordinary transverse bulkheads. This fore and aft bulkhead is pierced by only one locked door, the key of which is held by the chief engineer. The doors between the engine rooms and the stoke holes are in every instance duplicated, and the duplicate door is in every case under the control of the captain on deck.

When liberated, they close by their own weight, but they are fitted with glycerine cataracts to ease their descent. In the event of water flowing into the ship, the doors will close automatically. As the water rises in the bilge, it will buoy up a hollow piston attached to a rod. This rod on being pushed up about one foot removes the catch that holds the door.

The engines are triple expansion, with three cylinders of 43 in., 68 in., and 110 in. in diameter, and they have been constructed to develop 17,000 horse power. The pistons have a 5 ft. stroke, and the machinery, in accordance with Admiralty requirements, has all been placed below the water line. The boilers are twelve in number. Some are 13 ft. and some 12 ft. 6 in. in diameter and 17 ft. long, with six furnaces in each, and a grate area of 1,163 ft. The furnaces are fed with forced air to a moderate extent above the fuel and under the grate, and the boilers are designed to work up to 180 lb. The initial pressure in the intermediate cylinder is 80 lb., and in the low about 16 lb., with a vacuum of 27 in. The full pressure was not reached during the experimental cruise.

The propellers, which are 21 ft. 6 in. diameter, with a pitch of 28 ft. 6 in. and a superficial area of 128 ft., form a subject of special interest in this ship on account of the unusual manner in which they are placed. They overlap each other to the extent of 5 ft. 6 in., or, in other words, they each extend over the center line 2 ft. 9 in. The centers of their axles are 16 ft. apart, and the port side propeller is 6 ft. forward of the starboard, measuring from boss to boss. The port propeller is a left-handed screw, and the starboard a right-handed. Thus both work away from the ship, and the port propeller working in the loose water of the after screw makes two revolutions a minute more than its twin. The propeller shafts are 199 ft. and 205 ft. long respectively, and are entirely incased to the boss of the screw. The hull is very much cut away under the stern, and a large space has been cut in the frames to admit of the massive casting that carries the screw shafts. The stern post is connected with the rudder post by a bar on the line of the keel in the ordinary way, the scheme of allowing the rudder to be suspended without support below having been abandoned as dangerous.

The vessel herself is 582 feet long—the longest ship afloat—57 feet 6 inches broad, 39 feet 4 inches deep, and has a gross tonnage of 9,685 tons. She has a cutter stem, and, relying wholly on her two sets of engines, the masts are little more than three bare poles without yards. Thirty feet up the foremast is a sort of crow's nest for the lookout. Accommodation is provided for 300 first class, 150 second, and 750 steerage passengers. She has a promenade deck 245 feet long, with a clear way of 18 feet on each side of the deck houses. Some portion of this promenade is covered by an awning deck, which is used for stowing the boats. For the fittings and decorations throughout the boat, it must suffice to say that they are unusually lavish, even in these days of sumptuous ocean traveling.



THE WHITE STAR LINER TEUTONIC

A Quick Trip from Japan.

A consignment of silk and first-crop teas, occupying sixteen cars, arrived in New York on July 29 from Yokohama, via steamship to Vancouver, B. C., and transcontinental rail route to New York. The total distance was nearly 8,000 miles, and it took twenty-one days to accomplish it, including a delay of about one day in loading on the cars at Vancouver.

The Hydraulic Railway.

The hydraulic railway is a novelty attracting much attention at Paris just now. It is the development of an old project of Girard, the well-known French hydraulic engineer. The trains are without locomotives and the carriages without wheels, being supported on broad rails raised some distance above the ground by metal blocks. Before the train is set in motion, water under pressure is forced through valves in these bearing blocks, so that the latter are lifted off the rails and are carried on a thin film of water. The same agency is employed to propel the trains, a pipe, conveying water under pressure, being laid in the center of the track; from this pipe at short intervals rise stand-pipes with peculiar shaped nozzles controlled by a tap. Beneath each carriage is a long frame in which are a number of pallets, the surface of which can be acted on by the jet escaping from the nozzles. The action is extremely simple; the train being waterborne, and therefore having its friction reduced to a very great extent, is set in motion, and as soon as it passes the first stand-pipe opens the valve controlling the nozzle, when a stream of water under pressure is forced against the pallets under the carriages, accelerating the speed of the latter. As soon as each carriage passes, the valve controlling the nozzle is shut, and remains closed until the succeeding carriage opens it. The plans of M. Girard have been worked out in their present form by M. Barre, who claims many advantages for the system. The length of line laid down on the Esplanade des Invalides is about 200 yards, and the speeds attained are very considerable.

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THE CITY OF ABERDEEN, A GREAT LUMBER CENTER, WASHINGTON TERRITORY.

(*Continued from first page.*)

allowed. The tree in this view is about an average size. Many run from 10 to 20 feet in diameter.

The logs are carried over cross timbers laid on the ground, about 4 feet apart. These are called skids, and are kept well greased. Over them are hauled to the water the immense logs, which are then floated to the mills.

The photo. represents a dead monarch of the forest. Here lumber is king, same as cotton at the South and corn in Iowa.

Cast Steel Guns.

In the last issue of Proceedings of the Naval Institute, Lieut. Comdr. J. G. Eaton presents the results of a practical experience as inspector in several of the largest and best equipped steel works of the United States. Lieut. Comdr. Eaton's statements as to the two 6 inch experimental steel cast guns tried at Annapolis are valuable as being the first critically correct statement of the physical characteristics of the Pittsburg gun of Bessemer steel. It shows that the metal was much more unsatisfactory in structure at the breech than at the muzzle, the transverse elongation at the former being almost nothing. The gun was cast without a sinking head, which to a degree explains the sponginess of the metal, but not the remarkable variations in a comparatively small gun casting. "That such a gun should enter the lists and go upon any record as an exponent of any steel cast system is worse than a travesty. Its utter failure has proved that poor steel, poorly treated, cast without any of the usual safeguards, and afterward annealed, tempered, and annealed again by a process which was as strange to the manager as it was to the metals will not bear strains which call upon the best steels for all their strength and elasticity."

With regard to the Thurlow gun the "case is different and the results important." In this instance, metal and processes of casting being presumably correct, the cast steel theory was fairly subjected to trial. But though the gun endured the ten statutory fires without bursting, the serious enlargement of the bore was conclusive against it. "The elastic limit of the metal has been exceeded and the gun, for ordnance purposes, irreparably injured." As to the trials of the two guns, the writer concludes the paragraph with the observation that the results proved that the system of built-up guns must be our reliance, "for the present at least."

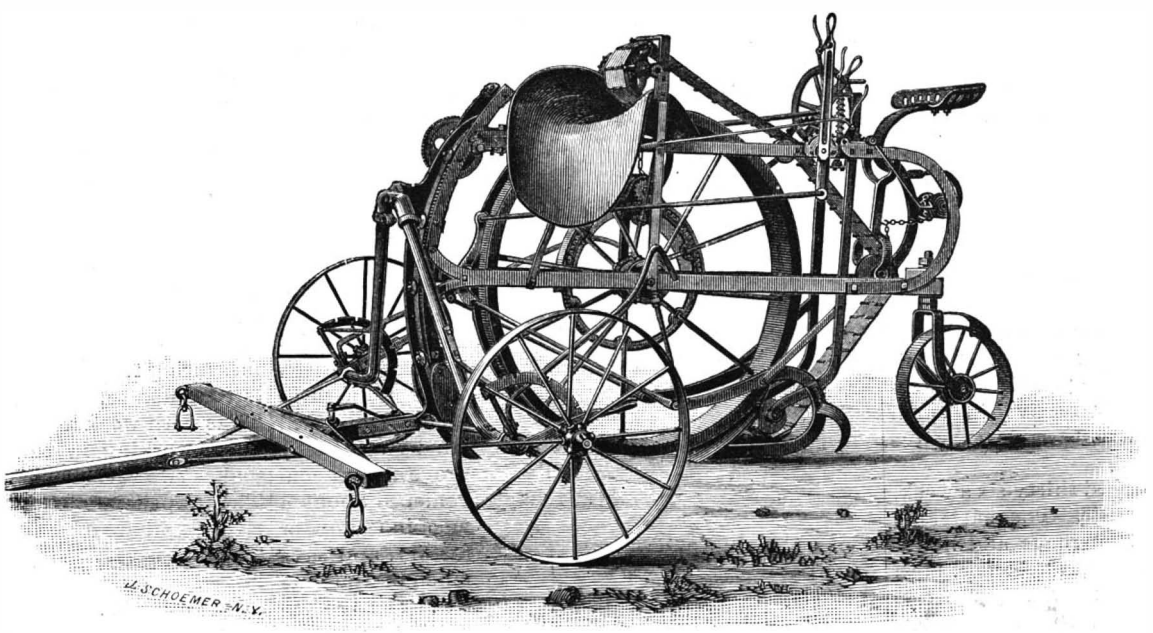
ABERDEEN, A CENTER OF THE LUMBER INDUSTRY OF WASHINGTON TERRITORY.

INK and rust stains are removed easily by a solution containing ten parts each of tartaric acid, alum, and distilled water. The solution has the trade name of "enerivoir."—*Pharm. Ztg.*

AN IMPROVED TILE DITCHER.

The accompanying illustration represents a machine recently patented by Mr. Herman I. Potter, of Leonardsburg, Ohio, and designed to cut trenches from ten to twelve inches wide to the depth of forty inches, with smooth bottoms, at the rate of ten to twenty rods per hour. The invention is an improvement on another machine for such purpose formerly patented by the same inventor, the improvement reducing the cost of manufacturing the machine and rendering it more easy of control and more effective in operation. The frame of the machine consists of two pairs of side bars connected at their rear ends by a curved or upright bar, and at their center by standards carried upward above the upper set of side bars to form essentially an arch.

To the middle parts of the lower side bars of the frame a large wheel is journaled, the rim of which is grooved to form a channel in which the dirt raised by the plow is carried up from the ditch by the belt, to be discharged at the side through a spout located over the wheel, at the top of the frame of the machine. The inner end of this spout is formed to fit into a channel in the wheel and serve as a scraper to remove the dirt therefrom. Only one man is required to operate the machine, and two or four horses may be employed, according to the nature of the soil. It is light and strong, being made of steel and malleable iron, and is designed to cut, at the will of the operator, from two to four inches each time it passes through the ditch, while the earth can be deposited on each side of the ditch in such a way that it can be readily replaced. This improved machine is in successful operation, and will be tested at the State fair, Toledo, Ohio, where it will be on exhibition from September 9 to September 13.



POTTER'S TILE DITCHER.

Bark Dust Explosion at a Tannery.

An explosion and fire occurred at the Eagle Valley sole leather tannery, Ridgeway, Pa., July 19, by which five workmen lost their lives and a considerable amount of property was destroyed. The building in which the explosion occurred was 40 by 200 feet long and only one story high, mainly occupied by bark leaches, and with mills at one end for grinding the bark. The explosion raised the roof from the whole building and drove out the gable ends, fire issuing so suddenly from all the doors and windows as to prevent the escape of the men employed, while a team of horses just about to enter were so much injured as to require their death, and the driver, ten to fifteen feet further off, was seriously disabled. The explosion occurred about 7:30 A. M., just after the machinery had been started, although it is stated that the bark mill was not running. The coroner's jury attributed the fire to spontaneous combustion, but as it was admitted that a man who was there to clean up the bark dust, and who was killed, might have had an "inclosed" lamp in his hand, and as at any time a piece of metal in a running bark mill may cause a spark capable of producing an explosion, it was perhaps hardly necessary to go so far for a possible cause, when no direct testimony was available. The explosion is the most severe and remarkable one that has yet occurred in a tannery, and shows that tanners should take as much precaution in caring for the dust made by their bark mills as millers are now generally doing in their work to guard against dangers whose real nature has not been definitely understood until within a few years past. A preventive for bark dust explosions is to keep the atmosphere about the bark mill saturated with steam.

MAGNESIUM is one-third lighter than aluminum, at the same time more dense, harder, and tougher. An article made from German silver weighing 5·5 kg. weighs only 1 kg. if made of magnesium. Atmospheric influence is about the same on magnesium and aluminum, but while alkalies, such as ammonia or soda, attack aluminum considerably, magnesium is not affected by them at all. Magnesium is worked into objects having sharp edges, screws, etc., more readily and with better results. It takes a high polish, is readily hammered and rolled; can be swaged or pressed like tin into any shape. It is at present about one-fifth cheaper than aluminum.

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Trout Culture.

A trout preserve requires a permanent supply of pure, cold water, and a sufficient feeding ground, where animal food—as aquatic insects, crawfish, frogs, and such minute creatures as exist in running streams—can be procured. Otherwise, these fish must be fed upon such food as milk curds, waste meat, and offal, finely chopped. Where a trout stream can be diverted in part into a pond, or a succession of them, an excellent preserve can be made.

Just now the eggs of these fish can be easily procured, either by purchase from dealers or through the fish commissioner at Washington, who is the agent for the public, who support a very complete establishment for this purpose. I have a fine trout stream running through my land here, which is doubtless the finest locality for this fish in North America, as the climate is cool and equable the whole year, and the copious rainfall (60 inches in the year) provides a large supply of spring water, containing an inexhaustible quantity of the best kind of food. Being a popular pleasure and health resort, a large number of visitors come here to enjoy the fishing and hunting, and were it not that the streams are restocked by spawn gathered at the proper season, and hatched artificially in suitable apparatus, the supply would soon be exhausted.

The hatching troughs are quite simple affairs. For 10,000 eggs, a wooden box 14 inches wide, 12 inches deep, and 6 feet long is sufficient. Mine are prepared as follows: The box, open on the top and at one end, is divided by cross cleats, 3 inches wide, set 16 inches apart in sections. A one-inch rustless iron pipe brings pure cold water from a spring into the troughs, the water flowing through the box so as to overflow the cross cleats and run off at the lower end, or it may pass from trough to trough through several of them. The sections are covered one inch deep with coarse, clean washed gravel, and the water is filtered through a flannel screen at the upper end of the trough. The lower end of the trough is open, but covered with a wire gauze strainer. The eggs are divided so as to put about 2,000 or 3,000 into each section, and are spread carefully with a feather, to prevent them from lying upon each other. Only pure water is used to flow over the eggs, and freezing is to be avoided as fatal to them. To prevent freezing, the troughs may be sunk a few inches in the ground and covered by a close shed, which need not be lighted.

The eggs, in a dormant condition, may now be procured. They are shipped by some rapid transit in boxes with damp moss. As soon as they are received, they are carefully transferred into pans of cold spring water, and the moss floated off without handling them. When quite clean, they are gently poured from the pan into the trough, and spread with the feather over the gravel, so as to lie closely, but not touch or overlie each other. They will hatch in thirty to forty-five days, as the temperature is warmer or cooler, when the tiny fish gets outside of the egg, but still adheres to it, and it may be seen swimming about with the egg still attached. The young trout are supported by the egg, which is all absorbed in course of time and disappears. When this happens, they may be turned into the stream to take their chances, or they may be fed for a few weeks until they are larger and stronger.

The food may be curd of milk rubbed up with water into a thin paste, which is quickly diffused in the running water of the troughs; or fresh liver or lean meat, pounded or chopped into very fine particles. The small fragments of food are picked up voraciously by the hungry infants, which grow very fast, and when an inch long are quite capable of taking care of themselves, along with other trout, in a stream or pond where there is plenty of room for them. They seek the shallow places, where larger fish do not venture, and shoals of the tiny things may be seen on the shallow, sandy banks. By fall they will be three inches in length, after which they will disappear in deeper water.

Some kinds of trout grow with amazing rapidity. Three years ago I put 100 California or rainbow trout into a millpond on the stream mentioned, in the fall; they were then "fingerlings," or three inches in length. A year after, I took one eight inches long, weighing half a pound. Last year some were taken fourteen inches long and weighing twenty ounces. The back is a deep purplish black, the belly silvery white, and the sides scarlet and crimson in various shades, melting into other colors. The flesh is as good as the best of the common speckled trout. The two species breed together, as I saw them last season pairing on the spawning beds on the bright gravel in the clear water, as I stood on the high bank of the stream. What the cross will be of course will not be seen until a year or two to come.

Trout may be preserved in a stream if the small fish taken are always returned to the water without serious injury. They seem to be but little hurt by the hook if it is carefully removed. I have released a small trout, hooked through the jaw or the nose, and have taken it again the next cast. Fish are cold-blooded and have a low nervous organization, and do not suffer pain as warm-blooded animals do; hence, when released after having been caught, go on their way without trouble. The loss of an eye by the hook is not any serious injury to them, and if the small ones under six inches in length are thrown back, the stock will soon be visibly replenished. I would like to impress this idea on those interested in the stocking of streams, so as to procure a law to prevent the killing or sale of trout less than six inches in length. I have taken trout no longer than this that were full of eggs fully two months before the spawning season, and on this account the close season for this fish might be anticipated by a full month earlier than it now is with much advantage to the future supply.

Trout will do well anywhere in streams which are supplied by springs, and are never warmer than 80° in the summer, and have deep holes and shaded banks and an outlet into a lake. They are found in the highest perfection in the Northern States, especially where they can winter in large lakes, or can run down in the fall to deep pools and estuaries; and especially in the Southern mountain region, where the clear, cold, pure water gives them the brilliant hues and firm flesh which I have not seen surpassed, excepting in the streams of Lake Superior. In ponds that are devoid of shaded banks, the required protection from the sun may be afforded by large plank floats, moored to stakes, under which they will gather at the heat of the day.

In feeding fish, care is to be taken not to foul the water with the refuse that is not eaten, and to give no more than will be consumed at one time. The newly hatched fish should be fed every two hours, with a very little food at a time. And it is indispensable that all sediment in the hatching troughs should be prevented, or removed if any should get in through the strainer; any dead eggs, which are opaque and discolored, should also be removed.—*Henry Stewart, in Country Gentleman.*

FELLING A MAMMOTH FIR TREE.

English and American Tailors.

For several days (says the New York *Star*) a neatly dressed, urbane gentleman, with an English accent and a large number of trunks, has been stopping at a Fifth Avenue hotel, where he has luxurious quarters and a good many visitors. Very few people know what his business is or anything about him, further than that he appears periodically in the spring and fall of the year, pays his bill, and departs for Europe. He is the agent for a fashionable tailoring establishment in London. So soon as he arrives in New York with his samples of goods he notifies some fifty or one hundred old customers, who live in New York or near by, that he is ready to call at their houses and take measurements, first sending for their inspection a large bundle of samples of his goods. After a couple of weeks in New York, the quiet gentleman takes passage for London, and in three or four weeks more the clothes begin to arrive, are assessed at the Custom House, the duty paid, and then delivered to their owners. There are many hundred men in New York who buy all their clothes in London, and others in different parts of the country, and they say that the English-made clothes do not cost any more than if made in the United States, after the duty is paid, and are, in fact, cheaper in some instances, while they possess all the advantages of London clothes, whatever those may be.

You can always tell an American who has just returned from Europe by the cut of his coat. No matter what else he may or may not buy while he is in Europe, our fellow countryman always makes it a point to lay in a supply of clothes when he reaches London. They always seem to be so very much cheaper there. You go about among the shops "pricing" things, and you find an English tailor charging twenty-five dollars for a suit of clothes for which a New York tailor would charge fifty dollars, using the same material. The same difference is observed in the price of nearly every article of clothing—overcoats, hats, gloves, shirts, flannels, etc.—and the temptation to buy is too strong to be resisted. One thing which always astonishes the American who orders clothes in London is the tremendous rapidity with which they are made. You have your measure taken in the morning, and a pair of trousers is delivered at your hotel before dinner time. Two or three suits can be made in twenty-four hours, and an overcoat in a day and a half. It would almost seem as if the various parts of the garments flew together, and in some tailoring establishments they actually advertise to make clothes "while you wait."

More Slow and Obsolete War Ships.

On August 22, proposals are to be opened at the navy department for five new cruisers, to be built on plans copied from what are now obsolete English ships, slow in speed, lacking in offensive and defensive means, not the latest and best designs. It is to be hoped the Secretary of the Navy will be able to defer the award of construction until Congress meets and time is given to modify the proposals so as to substitute later and better designs.

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Patents.*

The earliest laws of which we have any knowledge, that granted privileges and favors to persons who had made valuable improvements or inventions to relieve suffering and benefit humanity, were enacted in England less than one hundred years ago.

There was a system established during the reign of Elizabeth and the Stuarts that became odious. It was not a legal right, but a royal favor, and related to other things besides inventions, and extended to many articles in common use.

In the reign of James the First a law was passed known as the Statute of Monopolies, declaring all monopolies illegal and void, except copyrights and patents, which were granted for fourteen years.

This system, though somewhat modified, has become the established policy in this country, and is substantially a copy of the English law, in order to secure reward to the inventor.

There are some persons in our profession who think it is unprofessional to take out patents, but what would have been the status of dentistry to-day without the stimulus of reward for useful and improved appliances in the dental art?

Our country is a new world, and the American dentist is comparatively a new man; and the sooner he learns to do business on a plan that corresponds to the age in which he lives, the better it will be for himself and those who seek his services.

The men who invent are thinkers; they are persons of adaptation and consecration; they are, and have been, benefactors to their brethren, and, as a rule, they suggest and give away to their co-workers little suggestions without money and without price, to make dental operations easy, more than all the money they receive for their patents.

Inventions are the products of the brain, and they are just as legitimate as the labor of the hands. A certain orator was once asked how long it had taken him to prepare his oration; he replied, "Just forty-four years, for I am just forty-four years old, and I have given my whole life to this work."

I do not wish to be understood as advocating the giving patents away, for it is never best to give something for nothing, and the Creator does not deal in that way with his children in the various departments of nature. Everything is dual, and inventors are seers in mechanics, their minds become illuminated with visions of uses for the benefit of their fellows, and usually the whole working of the improvement is wrought out in the night, when the body is at rest, and we commune with ourselves without interruptions.

Almost all the improvements that have benefited the race have been first thought out and then wrought out to make us great as individuals or a nation.

It is the function of the brain to think, and the hands to execute the thought. The older men of the profession will recollect the ridicule that was hurled upon Dr. Atkinson and the use of the mallet in impacting gold in filling teeth some thirty years ago, and now we bring to its aid the various machines and electricity.

The unprecedented growth of our profession over either of the older professions is due largely to our freedom from the conventionalities that bind all professions to the past. Any innovations to long-time usages are almost certain to prove disastrous to those who discover the "new and more excellent way." The things we invent are children of the intellect and the affections. Man has no power to make or improve a thing without a love manifested toward the thing he desires to make better. The man who invents sees the improvement he wishes to make as we see the solar light before the sun makes his appearance in the morning.

One of the hindrances to our free use of improvements is that they have been bought up and laid aside by monopolies because they interfered with the sale of goods already in the market, and that has discouraged men of genius from trying to make appliances that would benefit the profession.

Success of M. Pasteur's System.

At the Academy of Sciences M. Pasteur recently presented a note of the results observed in the Pasteur Institute from May 1, 1888, to May 1, 1889 (*La France Medicale*, No. 73). During this period 1,673 persons bitten by rabid or presumably (*tres suspects de rage*) rabid dogs had been treated—1,487 French and 186 foreigners. Of this number—viz., 1,673—118 had been bitten in the head or face. Six persons (4 bitten on the head and 2 on the limbs) had been attacked with rabies during treatment; 4 others were attacked within a fortnight after the close of the treatment. Three persons bitten on the head died after the treatment had been completely finished, and these, therefore, represent the total cases of failure—viz., in the ratio of 1 in 557. Or if, "which would be illogical," adds M. Pasteur, to these 3 cases were to be added the 10 above mentioned, there would still be a mortality of only 1 in 128.

* Extracts from an article by J. A. Robinson, D.D.S., in the *Archives of Dentistry*.

The First Steamboat.

The idea of steam navigation, or at all events of navigation by mechanical means, seems even to have presented itself to Roger Bacon, for he made the following remarkable prophecy: "We will be able to construct machines which will propel large ships with greater speed than a whole garrison of rowers, and which will only need one pilot to direct them; we will be able to propel carriages with incredible speed without the assistance of any animal; and we will be able to make machines which by means of wings will enable us to fly into the air like birds." We may safely say that we have attained to the first two prophecies of Bacon, but, with regard to the third, I think the idea of aerial navigation by mechanical means is now very much in the same position as that of steam navigation before Symington produced his Charlotte Dundas. We want a man to put it into a practical shape. In this sense Symington was the inventor of steam navigation; he put theories into practice, and embodied in a patent taken out in 1801 the arrangements that are still in use at the present day in paddle wheel propulsion.

Symington was born at Leadhills, in Lanarkshire, in 1764, and, though educated for the ministry, he showed an early talent for mechanical pursuits, which he eventually followed. In 1786 he made a model of a steam carriage which he had invented, and exhibited it to the professors of Edinburgh University. Among others who saw this model was Mr. Patrick Miller, of Dalswinton, a wealthy gentleman who had experimented in naval architecture and the propulsion of small vessels by means of paddle wheels driven by manual labor. Mr. Miller was much taken with Symington's invention, and approved of his suggestion to substitute the steam engine for manual labor in driving his vessels. An agreement to make an experiment, at Mr. Miller's expense, was accordingly come to, and in 1788, after one of Mr. Miller's experimental boats had been fitted with Symington's patent engine, the first successful experiment in steam navigation was performed on Dalswinton Loch, the little boat attaining a speed of something like four miles an hour. The experiment was repeated on a larger scale in 1789 on the Forth and Clyde Canal, the engine used being Symington's patent, with ratchet wheels and chains for converting the reciprocating motion of the pistons into rotary motion, on the same principle as adopted in the Dalswinton experiment, but on a larger scale, the two cylinders in the first case having been each four inches in diameter by eighteen inches stroke, and in the second eighteen inches by three feet stroke. Neither of these vessels was of any practical value, however, beyond having demonstrated that a steam engine could be safely applied to propel a vessel; and after the 1789 experiment Mr. Miller unfortunately abandoned steam navigation altogether.

Symington returned to his occupation as a civil engineer, but still nursed the idea of introducing steam navigation, and in 1801 he found a worthy patron in Lord Dundas, of Kerse, near Grangemouth. Under his patronage he produced the Charlotte Dundas, designed for towing vessels on the canal, in order to do away with horses for that purpose; and this vessel, which was at work on the Forth and Clyde Canal from 1801 to 1813, has earned the well merited distinction of having been *the first practical steamer*. In this vessel Symington abandoned his old style of engine, and adopted the crank and connecting rod for producing rotary motion of the paddle wheel. The Charlotte Dundas was built at Grangemouth by Alexander Hart, in 1801. She was 56 ft. long, 18 ft. beam, and 8 ft. deep. She had a paddle wheel at the stern. The cylinder, which was 22 in. diameter by 4 ft. stroke, lay horizontally on the deck, and the piston rod was coupled direct by a connecting rod to a crank upon the paddle shaft. This vessel obtained a speed of about 6 or 7 miles an hour upon the canal, and towed upon one occasion two fully laden sloops—the Active and Euphemia—each about 70 tons burden, from Wynford to Port Dundas, a distance of 19½ miles, in six hours against a strong head wind. The wash from the paddle wheel, however, had a tendency to destroy the banks of the canal, and Symington was interdicted from using his steam vessel on the Forth and Clyde canal. Previous to this interdict the Duke of Bridgewater, having heard of the success of Symington's steamer, gave him an order for eight similar boats for the Bridgewater Canal; but unfortunately for Symington, on the very day on which he received the notice of interdict from the manager of the Forth and Clyde Canal, he also received the intelligence of the Duke of Bridgewater's death, and the order for the eight steamers was never executed.

From these disappointments, combined with the pecuniary losses which Symington suffered by his experiments, he never quite recovered. He died in London an impoverished man in 1831, and was buried in the churchyard of St. Botolph, Aldgate, London. Not even a simple stone marks his grave!—and yet this man produced the "patent boat" of paddle wheel steamers, and got up steam specially for the great Robert Fulton in July of 1801, in order that he might treat him to a sail of four miles along the canal and back again in an hour and twenty minutes—six years before Fulton ever produced a steamer in America, and eleven years before Henry Bell (who frequently saw and inspected the Charlotte Dundas) produced his Comet on the Clyde. Neither of the steamers which these two men produced was so complete in its mechanical arrangements as the Charlotte Dundas, and instead of being improvements upon Symington's ideas, they were rather the reverse, for in them small engines were geared up to drive the paddles, whereas Symington's plan was the bold, simple, and straightforward one that is in use to-day in some of the swiftest paddle steamers on the Clyde—viz., the large cylinder acting direct upon the crank on the paddle shaft.—*The Steamship.*

THE ELECTRIC ROLLING BRIDGES OF THE PARIS EXPOSITION.

Visitors take great pleasure in being carried from one end of the Machinery Palace to the other on the electric rolling bridges, a general view of which is given in our engraving. In fact, they are not indifferent, whether on foot or on this original vehicle, to traversing the 1,300 feet of the colossal gallery in which are accumulated so many wonders of mechanics. Moreover, many of the visitors, if not all of them, experience an intelligent satisfaction in thinking that the motive power necessary for this aerial trip is furnished by electricity, and constitutes an interesting example of the transmission of electric energy to a distance—that problem which is now in a large measure solved.

Rolling bridges are reckoned among the most important installations of the large mechanical works of modern times. In order to respond to the ever-increasing needs of the industries, our engineers have further and further increased the dimensions and weight of the parts of machines. The area of the works where such parts are elaborated has increased in proportion, and it is a genuine voyage that the pieces have to make in passing from the rough to the finished state, through the lathe and the drilling, bending, mortising, polishing, and other machines which constitute the present improved stock of tools.

The first care of the engineer is to arrange things so that the piece to be finished, starting from one end of the works, shall, as far as may be possible, reach the other end without having to turn back on the way. A return, in fact, presents a double inconvenience. It occasions a loss of time and force, and the risk is run of blocking the way of the piece that follows and of interrupting the work of the machines and their operators. Now, in well conducted manufacturing there is not a minute to be lost.

For small, light pieces that can be maneuvered by hand, the "circulus" that we have just described is easy to realize. For large pieces, which require for their handling the use of considerable mechanical power, recourse is had to lifting apparatus, pulleys, windlasses, cranes, and rolling bridges. Well equipped works should contain these in all directions, so as to permit of a rapid longitudinal or lateral transfer from one tool to another.

As for cranes, things are so arranged (as may be seen in foundries, for example) that the circle of revolution of the jib of each crane around its pivot shall intersect that of the adjoining crane. The piece thus passes from one hook to the other as far as to its destination.

When the arrangement of the works does not favor this, by reason of the supports of the framing, the cranes are placed upon rails so that they can go to get the piece, and, moving around the obstacles by means of turntables, carry it to its destination.

Rolling bridges are a recent and very useful modification of lifting apparatus. They consist of a strong, cross-braced platform, to which are attached the suspension pulleys, and which can be moved through the works. The bridge is of various forms. It may be supported by a large framework, movable on rails, or else may roll from one end to the other of the room, whose entire width it occupies when such width is not too great. In this case, iron girders placed under the framework serve as a track. Rolling bridges of small size are moved by hand through gearing. For large ones, recourse has hitherto been had to a steam engine carried upon the bridge and serving at the same time for lifting purposes. From the title of this article, we have seen that electric energy can hereafter be utilized with success for the same purpose.

The Machinery Palace of the exposition contains, as is well known, four rows of shafting girders supported by cast iron columns. Hangers fixed to these girders receive the horizontal shafts that are actuated by the engines, and by which the machines exhibited are driven. Mr. Vigreux, superintendent of the mechanical and electrical department of the exposition, conceived, at the beginning, the idea of utilizing these transmission girders for the running thereon of rolling bridges designed to maneuver and put in place, during the period of installation, the heavy parts of the machines to be mounted.

Messrs. Bon & Lustremant, on the one hand, and Megy, Echeverria & Bazan on the other, manufacturers at Paris, made proposals to furnish the apparatus, and

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it was decided to employ electric energy instead of steam as a motive power. These rolling bringes, 59 feet in length and 16 in width, present a utilizable surface of nearly 900 square feet. The ideathen naturally occurred to keep them running after the period of installation and to use them for carrying visitors, at an elevation of 25 feet from the floor, from one end of the hall to the other. The idea was a good one, for, as we have said, the visitors crowd into them with curiosity.

The following is a brief description of these apparatus:

Bon & Lustremant's Rolling Bridge.—Like analogous apparatus, and to answer the industrial requirements that we alluded to at the beginning of this article, the bridge is provided with three movements: (1) lifting of the load; (2) transverse carriage of the same, through a hook and wheels; (3) longitudinal carriage along with the bridge itself.

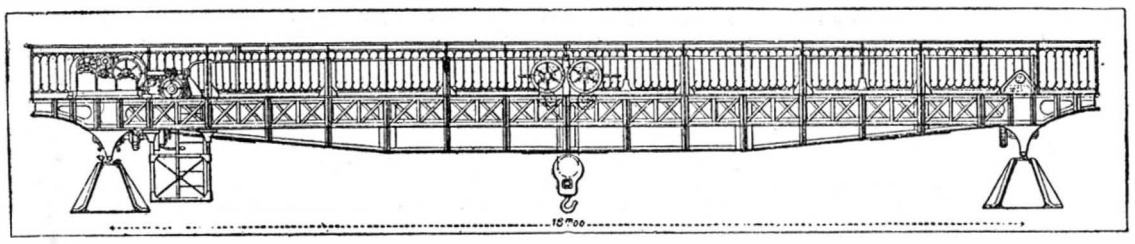

Fig. 1.—THE ELECTRIC ROLLING BRIDGE—PARIS EXHIBITION.

The framework consists of two large, solid, longitudinal girders of iron plate and angle iron, of two lattice girders connected with the latter by brackets, and of two transverse girders resting upon rollers. At one end of the bridge are united the mechanisms of the various movements, all actuated by electricity. The electric energy necessary is produced outside of the Machinery Palace in a special building, and is furnished by a Gramme generating dynamo, actuated through the intermedium of a belt by a 25 horse power high speed Westinghouse steam engine.

Two copper conductors supported by insulators lead the current to the receiving dynamo carried by the bridge. This dynamo transmits its motion to the various parts of the bridge through friction. The shaft of the receiving dynamo, prolonged to this effect, actuates, at high or low speed, through the intermedium of two rollers, a shaft that gives the three movements mentioned above. This shaft moves always in the same direction. The backward and upward movements are obtained by means of other friction disks, one of which is keyed to a shaft of the windlass, and the two others to a sleeve revolving with the shaft and capable of sliding on it. Upon leaving the sleeve to slide to the right or the left, one or the other of the disks of the sleeve is brought into contact with the disk of the windlass, and this is carried along in one direction or the other. The levers controlling the various movements are situated beneath the girders of the bridge, in a small compartment, and under the eye of the mechanician.

The total weight of the apparatus, with its accessories, is about 22 tons. Its platform holds from ninety to one hundred visitors by a little crowding.

Megy, Echeverria & Bazan's Rolling Bridge.—We shall pass more rapidly over the second bridge. Constructed upon the same programme as the preceding, and responding exactly to the same needs, it resembles it in all its principal elements. Let us state only that the transmission of motion, instead of being effected through friction disks, is effected by simple gearing by means of couplings, called progressive. This system consists of a circular spring, which, pressed by a lever in the hands of the mechanician, bears internally against the drum carrying the sleeve on which is keyed the gearing that transmits motion. It must be noted, too, that in order to diminish the tension, to equalize the parallel motions and diminish the resistance to traction, the transverse motive shaft of the bridge engages with the gearing at its center through an intermediate shaft that receives the motive power. This latter is furnished by a receiving dynamo constructed by Mr. Miot. The transmission of electric energy is effected as in the preceding apparatus.

Such, in its main features, is the installation of the electric rolling bridges of the Machinery Palace of the exposition. Aside from the pleasure experienced by the visitors, we see in it with interest the application of the transmission of electric energy to large lifting apparatus of this kind—a principle that has already been applied with success to ordinary cranes, hoists, etc.—*La Nature.*

Fig. 2.—GENERAL VIEW OF BON & LUSTREMANT'S ELECTRIC ROLLING BRIDGE.

Toning Gelatino-Bromide Prints.

Something extremely interesting to me was the appearance of a communication to a metropolitan society, embodying some experiences of the toning of silver bromide emulsion pictures with uranium nitrate and potassium ferricyanide, the constituents of Dr. Eder's negative intensifier. If one may presume to criticise Mr. Elder's remarks, they struck me as being very lucid, and I was able without difficulty to arrive at satisfactory modifications of the tones of bromide prints by following his instructions. That gentleman recommends 10 per cent solutions of both salts. The picture after fixation is to be washed in acidulated water and then freed of the acid and treated with equal parts of the solutions named in twenty parts of water. After toning, another washing and transference to a new hypo or alum bath. For the latter I do not recognize a necessity, and so in the few trials made omitted it, substituting for it, after a thorough wash and soak, an acid bath to remove any traces of insoluble compounds that may have remained on the print. A personal preference for less marked tones than the deeper browns given by employing the solutions at the strengths suggested led me to considerably weaken them. By this means I obtained what I aimed at, namely, an alteration of the cold black of the untoned print to a less determined hue, brown black, of greater range. I agree that a bromide print may be considerably improved in this latter manner by the application of the uranium-ferricyanide toning solution, which, moreover, possesses great latitude of power in imparting a well graduated series of pleasing tones.

Another useful application of the uranium-ferricyanide toning solution is in the modification of the color of gelatino-bromide opal pictures. Here, as with paper positives, one may run up and down the gamut of the brown group of shades and tones with perfect success. I have so employed the formula detailed with satisfactory and pleasing results. For those who do not like blacks or cool grays, this method of toning may be confidently recommended. It will, of course, not escape remark that with bromide paper and opals that are developed with oxalate of iron very stringent care is required to free the film from ferrous compounds before the application of the uranium-ferricyanide solution, otherwise ruinous blue stains are sure to appear. I attach little, if any, importance to the danger of yellow stains from the toning solution if its action be not protracted beyond a few minutes. In my trials some opals, with plenty of virginal margin, came out of the treatment quite immaculate, although only ordinary precautions were adopted to preserve their whiteness.—*Thomas Bedding, in Br. Jour. of Photo.*

Cooking by Electricity.

The Hotel Bernina, at Samaden, has for some time been lighted with electricity, power being supplied by a waterfall. As during the day the power is not required for lighting, and is therefore running to waste, the proprietor of the hotel has hit upon the idea of utilizing the current for cooking when it is not required for lighting, and an experimental cooking apparatus has been constructed. This contains German silver resistance coils, which are brought to a red heat by the current, and it has been found possible to perform all the ordinary cooking operations in a range fitted with a series of such coils.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING. — Alfred R. Heath, Covington, Ind. The design of this invention is to provide an automatic coupling of simple and durable construction, by means of which cars may be coupled with others having the ordinary link and pin couplings, as well as with those provided with this improved coupling.

RAILWAY SIGNAL.—Joseph W. Riggs, St. Paul, Minn. Between the tracks is a central rail having in its upper edge a groove in which are placed three conductors arranged in groups, to divide the track up into sections without any complicated switches or track instruments, the signal to be used for signaling from one train to another in case of accident, and for the prevention of collisions and derailment at drawbridges and switches.

Mechanical.

TOOTHED WHEEL. — John T. Redington, Ambler, Pa. This is a wheel in which removable toothed sections are employed, adapted for insertion in the periphery of the wheel, so that one or more sections may be taken out and others inserted when desired, on account of wear or accident, without disturbing the other sections.

CAR WHEEL CHILL. — Ferdinand E. Canda, New York City. This chill has two or more outer rings and a segmental inner ring, some of its segments being connected to one of the outer rings, and the others to the remaining outer ring or rings, whereby the heat of the molten metal will cause the inner peripheral chilling face to approach rather than recede from the axis of the chill, while providing adequate egress for the heat, steam, and gases generated by the molten metal.

SHEET HEATING FURNACE.—Evan J. Francis and Charles Banfield, Leechburg, Penn. By this invention the bottom for the heating chambers is formed of segregated masses, broken pieces, or fragments of non-combustible material having interstitial passages, and presenting a broken or uneven surface, whereby the sheets are heated to be annealed very uniformly.

Agricultural.

HAY STACKER. — Arthur E. Platt, Ottumwa, Iowa. Combined with horizontal and upright frames is a beam having an axle and reduced curved forward part, a fork formed with a shank frame and having curved and straight teeth, and an operating rope, the construction being particularly adapted to stack hay that is in shocks, raising a shock at a time, and also adapted to take straw away from a thrashing machine.

LAWN MOWER. — Charles A. Olcott, North Vernon, Ind. This invention provides an easily operated machine having few and simple parts, and adapted to cut underneath fences and over walks where mowers having revolving cutters would be useless, the machine cutting very fast with the expenditure of but little power.

CHURN.—Hale E. Hawk, Bucyrus, and Wesley Smith and Joseph F. Fox, Pierce, Ohio. This invention covers a swinging churn in which, when the body is reciprocated, a rotary motion will be imparted to the dasher, the churn being so made that its frame can be readily folded when not in use, while the dash can be easily removed to facilitate cleaning and removing the butter.

Miscellaneous.

ASTRONOMICAL MIRROR. — Dennis O'Brien, Oswayo, Penn. Combined with a pan formed with a mirror seat is a centrally apertured mirror, a threaded sleeve being held in the aperture engaged by disks on the opposite sides of the mirror, the object being to produce concave mirrors of long focus from plane-faced mirrors.

ROLL HOLDER FOR CAMERAS.—Erastus B. Barker, New York City. Combined with a plate or sensitized sheet holder are removable light-tight cases or boxes for carrying the sensitized paper and for supplying and taking up the exposed portions of the roll, the roll to be drawn upon as required to expose successively different portions of its surface for the purpose of making a series of pictures, one after the other.

BOOK OR MUSIC HOLDER.—Susan M. Perkins, Lansing, Kansas. This is an improvement in that class of book or music holders which consist of spring clamps adapted to slide toward or from each other upon a flanged or slotted bar, a stretched wire being employed to support the clamps instead of the bar, and affording some important advantages.

GRAIN WEIGHER AND REGISTER.—August H. W. Droste, St. Charles, Mo. The grain receptacle is formed in two compartments and is mounted to slide vertically, a tilting grain bucket discharging alternately into the compartments, a pivoted arm being connected with the grain receptacle and a weighing beam connected with this arm, the machine being adapted to be easily and conveniently attached to a thrashing machine.

METHOD OF OPERATING GAS ENGINES. —Henry Hoelljes, New York City. This invention provides for using lower temperatures in gas engines, avoiding dissociation of the products of combustion, by employing compressed air kept separate from the explosive mixture until the combustion takes place, the air being intended to absorb the heat produced, diminishing the loss of heat through the cylinder walls and avoiding the use of water jackets.

ORE ROASTING FURNACE. — David R. S. Galbraith, Auckland, New Zealand. This is a shaft furnace having feed openings at the top, with inclined and apertured offsets, and gas inlet openings near the bottom of a rotary shaft on which are dished disks, the furnace being portable and specially adapted to secure the suspension of the finely divided ores in a gas or mixture of gases, and at the required temperature, during a certain length of time.

WEIGHING OIL TANK. — Elmer N. Bachelder and Fred E. Lovejoy, Portland, Me. A weighing tank is supported upon one arm of a scale beam fulcrumed below a reservoir, a latch engaging with a weight carrier being pivoted upon the other arm of the scale beam, with a connection between the reservoir and weighing tank, whereby oil may be delivered from one tank to another and the amount delivered be determined by weight.

AUTOMATIC RATCHET COCK. — James J. Powers, Brooklyn, N. Y. This invention consists of a combined pivoted arm or float and ratchet device to act in connection with a suitable wheel for operating the valve, designed to cause an intermittent flow from a cock and be perpetual in its action.

AUTOMATIC DISINFECTING TANK. — James J. Powers, Brooklyn, N. Y. Combined with a sewage tank, an elevated reservoir, and a measuring box connected to the reservoir by a conduit and valve casing, is a cock fitted in the valve casing, formed with three passages and having a float arm, whereby the rise and fall of the sewage in the sewage tank automatically admits chemicals in the requisite proportion and without waste for the antiseptic treatment of the sewage.

DISINFECTANT. — Charles F. Bond, Chicago, Ill. This is a compound for disinfecting and deodorizing purposes generally, and consists of certain proportions of slaked lime, red ocher, carbolic acid, creosote, bichloride of mercury, salicylic acid, etc.

STREET WASHER. — Juan B. Arei, Brooklyn, N. Y. In this device a cast iron box is set into the pavement, with cover to prevent surface water and dirt from entering the box, into which projects a pipe connecting with the street main, and an operating rod for turning the water on and off, and also for turning on and off the water from the house, all danger of breakage and displacement by frost being obviated.

BREECH LOADING GUN. — Gustave S. Boesch, Freetown, Mass. In this gun the hammer is provided with a catch separate and independent from the bolt, and adapted to engage it when thrown forward and retract it and become disconnected therefrom when raised into the firing position, whereby the gun may be rapidly loaded and fired, and in which the firing cannot be effected without closing and locking the breech.

LOCK.—Oluf Valkerts, Sac City, Iowa. This lock has a bolt provided with a rack, the tumbler case having teeth which engage the rack, the tumblers within the case having adjustable plugs engaged by stems arranged in connection with springs, and keepers on each side of the tumbler case, all corresponding parts being interchangeable, while the lock can be set to a variety of combinations almost innumerable.

OAR. — Horatio F. Hicks, Ashland, Oregon. This invention relates to metal-bladed oars for rowing and sculling, the blade being curved or dish shaped, and having a longitudinal groove or channel on the convex side, which forms a stiffened rib on the concave side, while the blade is corrugated or ribbed on its surface from near the channel to the edges of the blade.

VEHICLE BRAKE.—John Mani, French Gulch, Cal. Combined with a brake-operating slide and adjacent rack is a latch lever or pawl pivoted to the slide and adapted to engage the rack, the vertical members of the slide and latch lever having foot pieces one above the other, the construction being such that the foot rail may be used for the operating lever, and the entire surface of the shoes brought in contact with the wheels when the brake is applied, and entirely removed therefrom when the brake is taken off.

DRAUGHT SPRING FOR VEHICLES.—James A. Robson, New York City. This invention provides a sliding plate in a support adapted to carry a whiffletree, a casing inclosing a spring projecting from the support, there being in the casing a sliding plate against which one end of the spring rests, the attachment being such as can be easily applied to all vehicles, to regulate and even the draught.

MOTOR FOR VEHICLES.—Jonas Potter, Johnstown, Pa. This motor is designed for use generally with machinery as well as vehicles, in connection with prime movers, for increasing their efficiency, and consists in the combination of long and short levers and of sprocket or gear wheels for transmitting power to the mechanism in which the power is utilized.

RADIATOR. — Joseph Liedl, Fergus Falls, Minn. This invention covers an apparatus adapted for attachment to a heating or cooking stove, or any perpendicular stove pipe or furnace flue, and designed to cause a circulation of the cold, stagnant air usually found near the floor, also heating it to equalize the temperature of the room.

FUEL CARTRIDGE. — William Daly, New York City. This is a cartridge adapted to be placed in an upright position on the grate, and is composed mainly of a cylindrical casing, whose outer portion is filled with asbestos, the casing having a central bore, the cartridge being adapted to be charged with kerosene oil, etc., and to burn without smoke, air being supplied and an inflammable gas generated and consumed with the oil.

KNOCKDOWN FURNITURE. — Arthur White, Sheboygan, Wis. This invention covers a novel construction of kitchen safes, wardrobes, and similar furniture, so that the articles may be easily and quickly set up for use, and will be strong and durable, while in knockdown condition they may be packed in small space for economical handling, storage or shipment.

CLOTHES HORSE AND IRONING BOARD. —Lydia Fairweather, Richmond Hill, N. Y. This is a combined device, consisting of a main frame with upper and lower brackets, clothes frames being hinged on the main frame, while an ironing board has pins at its inner end adapted to be hooked on the brackets, and is provided with a leg, the device being foldable in small space.

SUN AND VAPOR BATH. — Edwin D. Babbitt, New York City. This is a box with side reflectors and a glass pane in its inclined front, colored strips of glass being placed on the pane for subjecting the body to different light rays, while a colored glass is held in front of the head, that it may receive only the cool rays, while the box has a wire mattress, and is adapted to receive a steaming pan.

BOUGIE. — George Morlot, Paterson, N. J. This invention relates to depurators coated with a medical composition, and consists of a flexible core formed of whalebone, with a handle, a rounded head, and a medicated composition extending over the core and head.

COUGH SIRUP. — Francis M. Jaques, New London, Conn. This sirup is made of rock polypody, wild cherry bark, hoarhound herb, rock candy, granulated sugar, glycerine, and other ingredients, in specified proportions, and prepared and administered in a manner described.

SCIENTIFIC AMERICAN

BUILDING EDITION.

AUGUST NUMBER.—(No. 46.)

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4. A New England mansion. W. B. Tubby, New York, architect. Perspective elevation and floor plans.
5. Elevation in perspective and floor plans of a cottage at Jersey City Heights. Cost twelve thousand dollars.
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7. A handsome country residence at Belle Haven Park, Greenwich, Conn. Cost eleven thousand dollars. Perspective and floor plans.
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13. Brick dwellings recently erected in Jersey City, N. J., at a cost of three thousand eight hundred dollars each. Plans and perspective.
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Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Important—The whereabouts of one Stephen G. Canfield is wanted. Address, Palmer Canfield, Rondout, Ulster Co., N. Y. Death of father.

For Sale—Potter's tile ditcher. Patented. For description see page 118.

Wanted—A man to act as superintendent of a sash and door factory. Must be competent to take charge of men, make drawings and estimates on all classes of work. Best of references required. Address B. Edwards, 59 Chicago St., Buffalo, N. Y.

Model steam engine. Cir. free. Edgar Side, Phila., Pa.

Wanted—An expert mechanic to take charge of a factory making electrical and mathematical instruments. One who has good business tact, and can invest some capital, or who can furnish security and take the factory on contract, preferred; advertiser to take entire product. Address W. H. Stevenson, care Thomas A. Phelan, 93 Front St., New York.

Soft, pliable leather coats, $6.50; pants, $5.50; vests, $3.50. Delivered. Perfect Clothing Co., P. O. box 2638, N. Y.

For Sale or Royalty—Baling press, patent No. 406,680, described in SCIENTIFIC AMERICAN, No. 5, Vol. 61. Has great compressing power; light and easy to operate. Meets a long felt want of farmers, broom corn, cotton, and wool growers. Manufacturers on royalty can have a bargain. W. E. Walter, Silver City, Idaho.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For the latest improved diamond prospecting drills, address the M. C. Bullock Mfg. Co., Chicago, Ill.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Screw machines, milling machines, and drill presses. E. E. Garvin & Co., Laight and Canal Streets, New York.

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Billings' Double-acting Ratchet Drills. Drop Forgings. Bronze Forgings. Billings & Spencer Co., Hartford, Conn.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Safety Elevators, steam and belt power; quick and smooth. The D. Frisbie Co., 112 Liberty St., New York.

Veneer machines, with latest improvements. Farrel Fdry. and Mach. Co., Ansonia, Conn. Send for circular.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

Rotary veneer basket and fruit package machinery. I. E. Merritt Co., Lockport, N. Y.

Wardwell's patent saw benches. All sizes in stock. Rollstone Machine Co., Fitchburg, Mass.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1173) B. & Co. write: In shipping car loads of goods we paste advertising posters on the sides of the cars. We have been using gum tragacanth, but it does not stick so but that the wind blows the posters off. Can you suggest some cheap, easily made, and convenient paste which will overcome the difficulty? A. Use a cheap, hard-drying varnish, and varnish the face of the circular as well as the car body under it.

(1174) G. S.—All clays contain aluminum, but its extraction is difficult, expensive, and requires special skill in manipulation.

(1175) J. S. asks: Is there any cheaper electric telephone than the Bell? A. The Bell telephone is protected as a monopoly by patent right. It is cheaply constructed, though other receivers could be made still cheaper. As receiver and transmitter it represents about the cheapest type.

(1176) J. D. McD. asks for information concerning submerging boats in America. A. We refer you to the files of the SCIENTIFIC AMERICAN, where various attempts have been described. No boat has been yet in practical use in this country, though it is to be hoped that under the new appropriations for the navy one will soon be built. Steam, naphtha, electricity, and Honigman's soda engine have all been proposed as motive power.

(1177) J. W. G. writes: Can you tell me of a silver-plating bath that is not so poisonous as the cyanide and that will give as good a plate with a battery, while it is, at the same time, easily handled? A. Cyanide solutions are universally used, and give the best results. A solution of sulphate of silver in carbonate of ammonia solution has been recommended for a certain class of work. The sulphate is made by adding sulphate of soda to nitrate of silver, both in solution.

(1178) L. D. P.—The proper rating of microscopes is by the number of diameters that they magnify. The other rating, which is made for effect on purchasers, is the area, which is equal to the square of the number of diameters.

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(1179) J. H. K. asks how to make cloth that is used in lining shoes waterproof. A. Use oiled silk or heat the linings in melted paraffin.

(1180) S.—Shears are made of wrought iron drop-forged, finished, and case-hardened, also of cast malleable iron case-hardened, also of cast malleable iron with steel facing welded, also of all steel.

(1181) W. S. R.—For method of etching on steel see SCIENTIFIC AMERICAN, April 23,1887, Notes and Queries, No. 21. The sponginess or honey-combing of alloys is caused by the metals boiling. The metal that melts at the highest temperature should be melted first, or as soon as it begins to melt add a little of the metal melting at the next lower temperature, which will facilitate the melting. When just melted, the balance of the mixture should be gradually added and the temperature lowered by slackening the fire; pour the metal at as low temperature as will allow it to run and fill the mould.

(1182) C. A. B. asks the best way of cleaning pressed brick and stone, and the best oil to use on them. A. Water and a stiff brush is all that is needed, unless the bricks are stained with something that requires soda or weak acid to remove. For oiling use boiled linseed oil.

(1183) G. W. G. asks a receipt for cleaning a badly rusted gun barrel. A. There is no way of properly restoring a badly rusted gun barrel save by complete refinishing. Rubbing the rusted surface with a steel scratch brush and oiling with linseed oil will make it passable.

(1184) B. W. E. asks what sign of the zodiac belongs to each month of the months of 1890. A. January 20 to February 19, Aquarius; February 19 to March 20, Pisces; March 20 to April 20, Aries; April 20 to May 20, Taurus; May 20 to June 21, Gemini; June 21 to July 22, Cancer; July 22 to August 22, Leo; August 22 to September 22, Virgo; September 22 to October 23, Libra; October 23 to November 23, Scorpio; November 23 to December 21, Sagittarius; December 21 to January 20, Capricornus. The constellations are about one month later now than when this system was first adopted, due to the precession of the equinoxes.

(1185) G. W. K. & Son ask: 1. What is the greatest known depth that oceans have been sounded? A. Over 4,000 fathoms. 2. Has life been discovered at the very lowest soundings? A. Yes Animal and vegetable life has been found at the greatest depths, and down to 3,000 fathoms very abundant.

(1186) J. B. T. asks if there is any effective way of ridding a cellar of fleas that have literally overrun everything. A. If my cellar were infested as stated, I should go carefully over it with benzine and a hand atomizer of large size, spraying every inch of space and particularly cracks and corners. I should be very careful, however, not to introduce a light into the cellar until the benzine had been given a number of hours or days to become thoroughly dissipated.—L. O. Howard.

(1187) H. L. writes: Early in the fall of 1886, I made up a lot of cider, which proved not very palatable, and it was turned into vinegar barrels, with the expectation that it might prove of some value in that direction. It has been coaxed since with yeast to promote sound fermentation, with straw paper and molasses, etc., and it is about as insipid as ever. Is there any way the stuff can be converted into vinegar? A. The original cider was probably at fault, and by its deficiency in sugar and alcohol produces a very weak vinegar. We do not see that anything can be done unless you add sugar, glucose, or molasses, and carry it through the alcoholic and acetous fermentation. The addition of alcohol or alcoholic spirits would be more direct, but also more expensive.

(1188) C. A. B.—The proper magnifying power of microscopes is expressed in diameters, while the extravagant expression of millions occasionally appears in newspapers. Good microscopes—and there are none better than those made in the United States—magnify all the way up to 2,000, which, when squared, means the magnification of areas, which for the above number of diameters amounts to 4,000,000. No microscopist or scientist uses these expressions without explaining their meaning.

(1189) W. T. B.—For shellac varnish, dissolve shellac in 95 per cent alcohol in quantity to make the varnish of the proper consistency for the use that you require. For metals it should be very thin, for woodwork should be thin enough to spread easily with a camel's hair brush. Stratena is a liquid glue. Use charcoal or gas retort carbon only for batteries.

(1190) R. J. C. asks: What is the evaporation per pound of coal in a run of four hours, average pressure 82, temperature of feed water 210°, coal burned 480 pounds, water evaporated 4,500 pounds. A. 9·37 pounds of water evaporated per pound of coal.

(1191) J. B. C. writes: Suppose a canal to be 100 feet wide at the surface, 60 wide at the bottom and 20 feet deep, with a sectional measure of 1,600 square feet, that the canal has a regular fall of 12 inches to the mile. Is there any formula by which may be calculated the velocity of the current? A. The formula is

$$\sqrt{\frac{\text{Area}}{\text{coefficient} \times \text{length} \times \text{perimeter}} \times 2\,\text{gravity} \times \text{hgt. of fall.}}$$

For your statement the velocity is 5·2 feet per second. See Haswell's Engineer's Pocket Book, which we mail for $4.

(1192) J. F. L. asks how to make a good polish for lead pipe, one that will keep its luster and not injure the pipe. A. Rub the pipe with a wet woolen cloth with ground pumice to take off dirt and oxide. Then rub with whiting on a cloth wet. It will not stay bright unless varnished or lacquered, for which you might give it a coat of mastic.

(1193) S. G. D.—The stays for boiler heads are made to meet the strain due to each size head at the test strain, with a proper allowance for safety. See Sexton's book on steam boilers, $2, which we mail for the price.

(1194) W. H. W.—You cannot make good engine brasses from old brass. A good mixture should have 80 per cent copper to 20 per cent tin. For a cheap brass for oil cups use copper 2 parts, zinc 1 part by weight.

(1195) C. A. writes: I have sun dial which has engraved upon it north latitude 31° 30′, range 30° to 33°. Would that dial give the correct time at this place (Kansas), which is about north latitude 39°? How should the dial be set so as to give correct sun time? A. If it is a vertical dial, the stile is probably 58° 30′ from the vertical. By changing the angle to 51°, it will be right for your latitude. Set the face vertical and the stile pointing to true north.

(1196) V. F.—All pressure gauges are marked in pounds per square inch. The siphon gauge is indexed by inches, which is equivalent to pounds per square inch, the real difference being 2 inches by the fall of the mercury in the other leg. Vacuum gauges are marked to correspond with the barometer, and are read by inches, which equal a half pound to the inch, in pounds of vacuum.

(1197) J. B. asks: What will prevent the sal-ammoniac in a Leclanche porous cup battery for electric bell from overflowing all over the outside of jar? A. Use a weaker sal-ammoniac solution. One just below the point of saturation is the best. Dry your glass jars, and coat their upper edges with paraffine.

(1198) W. H. asks: Can I make the dynamo-electric machine described in SUPPLEMENT, No. 600, run easier by reducing its candle power to 2 or 4 16-candle lamps? A. You can make the machine run easier by connecting all the wires of the field magnet in series, and arranging the connections as in a shunt machine. Introduce a variable resistance into the field magnet circuit, and the machine will operate two or four lamps and run proportionately easier.

(1199) D. J. J. asks how to make the quickest drying ink. A. For quick drying ink use alcoholic solution of desired aniline color. This will have the great objection of drying rapidly in the ink bottle. An aqueous solution of nigrosine, the latter being first dissolved in alcohol and then added to water, should answer every purpose as regards quick drying.

(1200) E. P. asks what kind of coal ignites the quickest and, at the same time, makes the largest volume of blaze. A. The cannel coals or bituminous, used by blacksmiths.

(1201) J. F. G.—You can retain the luster on copper only by repeated polishing, or lacquering with very thin shellac varnish. Thin with alcohol (95 per cent) until it is nearly transparent or of a wine color, in a clear bottle, and allow it to settle. Warm the articles to 200° or nearly the temperature of boiling water, and apply the varnish very quickly with a camel's hair brush.

(1202) E. S. R. asks the resistance by wind against the end of a passenger car running at the rate of forty miles an hour. A. The pressure is 8 pounds per square foot, or about 700 pounds. The skin friction of the top, sides, bottom, and wheels should also be added to the square feet of the front of a car or train.

(1203) S. E. G.—The term "pivotal motion" is applicable to all motions or movements that are governed or constrained by a pivot or fixed bearing. All circular motions are not necessarily pivotal, and many may be more properly styled axial.

(1204) W. S. D. S. asks: What becomes of the sap that rises in the trunk or stem of a plant? Does any portion of it return to the roots of the plant after it has matured or at the close of the summer season? A. The water constituent of the sap is eliminated through the surface of the leaves and stalks, while the solid solubles of the sap are absorbed in the development of the plant or tree. The sap does not return, but ceases to flow with the change in the seasons.

(1205) A. W. W., of Alma, Mich., says: I planted two white pines last fall, and they grew beautifully until about a month ago, when a borer or black bug attacked them, and they are slowly dying. Can you tell me anything I might apply to prevent this, and much oblige a subscriber of your valuable paper? A. The specimen sent was referred to Prof. L. Howard, who says: It is one of the common pine bark borers, which has been called the fine writing bark beetle (*Tomicus calligraphus*). I regret very much to state that there is nothing which Mr. W. can do to save his trees after they have been once attacked. As a matter of fact these beetles prefer diseased or dying wood, and in the woods they never attack healthy trees, but are always found in those which are dying from some other cause. They are brought into cities with fire wood, and, escaping, find no trees just suited to their purpose, and so attack the next best thing, which is some healthy door-yard pine. As a preventive it would be well to purchase only pine kindling or fire wood from which the bark has been removed, or to keep during the summer, in some place in the yard, a few pine branches from the woods, which should be renewed from time to time and the old ones burned. Such branches will not attract beetles from the trees in which they have once established themselves, but they will attract any free beetles which may be around, and which might otherwise attack the ornamental trees.

(1206) W. A. C.—Water freezes down from the surface. It freezes at the bottom first, only when anchor ice is making in a swift and rough, shallow stream, when the temperature of the water gets below the freezing point, but is prevented from congealing by its agitation. The stones under water become colder than 32° when the cold water in contact begins to congeal. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 171 and 406, for interesting articles on the physical properties of water.

(1207) F. D. S. asks a recipe for making court plaster. A. Isinglass 125 grains, alcohol 1¾ fluid ounces, glycerine 12 minims, water and tincture of benzoin each sufficient quantity. Dissolve the isinglass in enough water to make the solution weigh four fluid ounces. Spread half of the later with a brush upon successive layers of taffeta, waiting after each application until the layer is dry. Mix the second half of the isinglass solution with the alcohol and glycerine and apply in the same manner. Then reverse the taffeta, coat it on the back with tincture of benzoin, and allow it to become perfectly dry. There are many other formulas, but this is official. The above quantities are sufficient to make a piece of court plaster fifteen inches square.

(1208) E. J. B. asks how a ball in a base ball game can be curved, and whether it can be curved or not. A. You will find base ball science fully discussed and illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 402, 410, 423.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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August 6, 1889,

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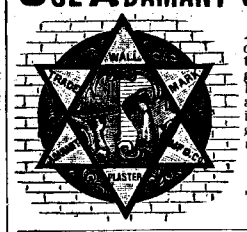

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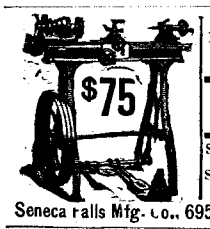

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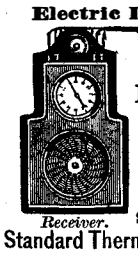

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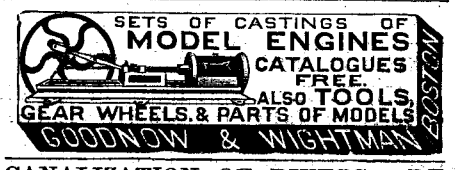

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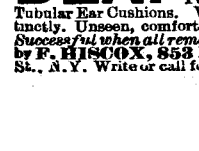

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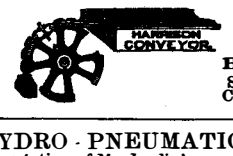

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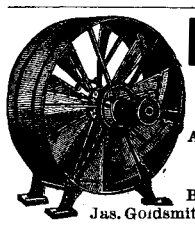

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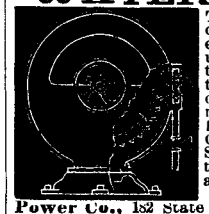

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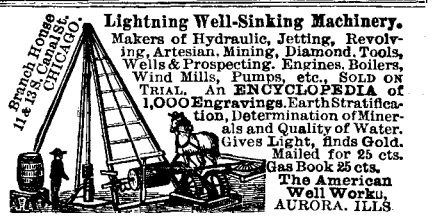

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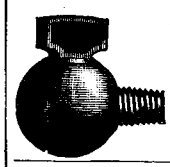

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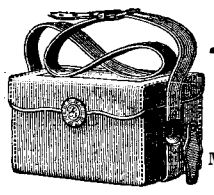

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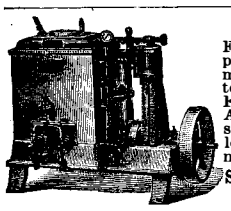

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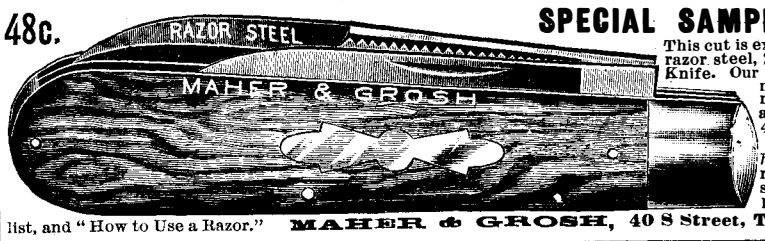

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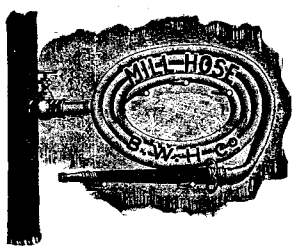

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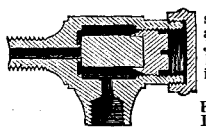

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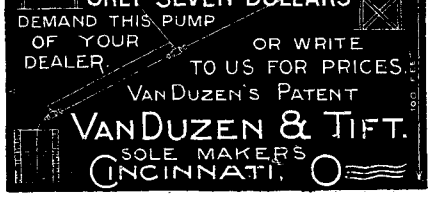

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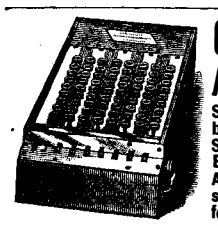

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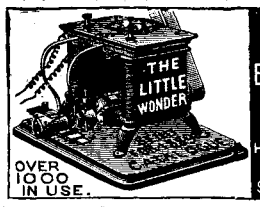

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